JULY, 1955

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

IN THIS ISSUE

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"are you budgeting your show time adequately?"

•

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•

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•

QUALITY CONTROL of Fine SURFACES

•

HARDENING by INDUCTION

•

Screw Machining:
"9⅜ Seconds per Piece, 384 Pieces per Hour"

•

AUTOMATION for Bumper Line

•

Direct Reading FEED RATE METER

•

MACHINABILITY COMPUTER

Huebner Publications, Inc.
CLEVELAND 13, OHIO

BPA

PUTNAM END MILLS

Produce Finer Finishes

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Your toughest milling operation is an opportunity to prove the unusual superiority of Putnam End Mill design and manufacture. Select from over 1200 sizes and types of standard Putnam End Mills the one for your job and then watch it more than meet the challenge with faster, smoother cutting.

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"TRU-LINE" PROFILE DRESSING TOOLS

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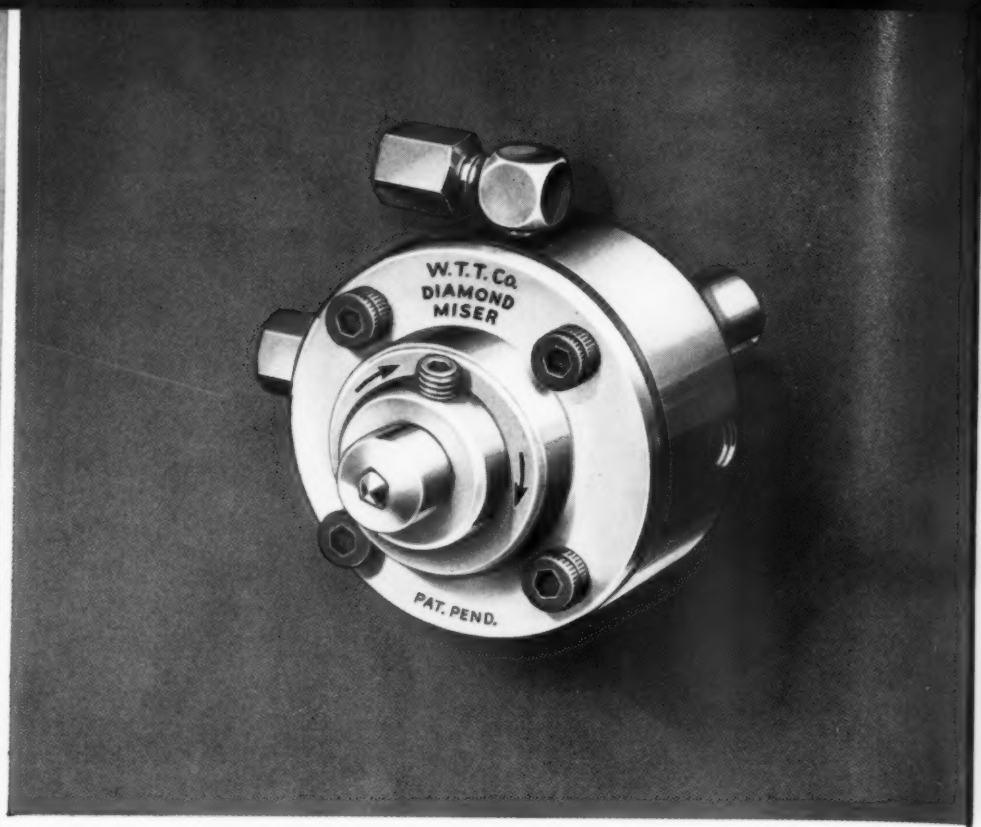
STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING

INDUSTRIAL DIAMONDS



YOU CAN EASILY CUT GRINDING COSTS WITH WHEEL TRUEING'S HYDRAULIC DIAMOND-MISER

There are three spots where the Hydraulic Diamond-Miser helps you save on grinding—in diamond costs—in wheel costs—in elimination of down time for diamond turning.

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Perhaps your own operation offers opportunities for such savings. Would you like to talk it over with one of our field engineers? May we send you our descriptive booklet?

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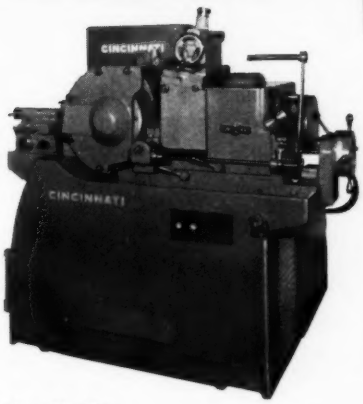
New CINCINNATI FILMATIC No. 0 Centerless Grinding Machine. Catalog No. G-640 contains complete specifications.

CINCINNATI



Cincinnati offers the only complete line of Centerless Grinding Machines.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Keeping the cost of precision grinding in line with the size of small parts is often quite a job. Now you can do something about it. CINCINNATI FILMATIC No. 0 Centerless Grinders are completely new, designed specifically for small work up to ½" diameter. They require but little floor space, only 63" x 61½", yet the machine is ruggedly constructed to remove metal rapidly up to the full capacity of the 5 hp grinding wheel drive motor. ¶There are a number of reasons why these new CINCINNATIS are such efficient, low-cost producers:

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b) Double slide construction between bed and regulating wheel housing simplifies setups; facilitates infeed grinding

c) Automatic and oil-shot lubrication

d) Tachometer indicated, infinitely variable regulating wheel speeds

Would you like to know more about new CINCINNATI FILMATIC No. 0 Centerless Grinders, and how they can reduce the cost of small precision parts? Write for catalog No. G-640.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

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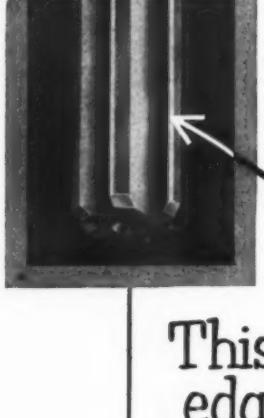
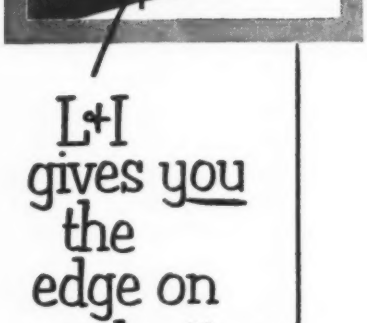


This edge cuts reaming costs



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The Reamer Specialists

L&I

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXI—No. 4 JULY, 1955

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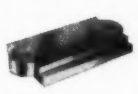
can you guess the number of different center post

DANLY DIE SETS

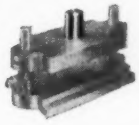
in stock–in just one size ?

67 ? 575 ? 1433 ? 31,104 ?

3 different punch holder thicknesses

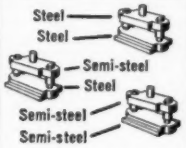


3 different die shoe thicknesses



6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of 3 different styles to choose from

If you guessed 31,104 different standard center post Danly Die Sets in just one size . . . then you were right! Simply multiply together all of the variation possibilities shown in a Danly Catalog for a 12x12 standard center post precision Danly Die Set, and you'll get this remarkable figure. Even more remarkable is the fact that *all* of these variations are cataloged and *stocked* in every Danly Branch.

Just how does this benefit you? This almost unlimited variety of Standard Danly Die Sets in stock at your Danly Branch is your assurance that you can always get the die set you want . . . *when* you want it. That's important in saving tooling time. So remember, when you want the best in die sets—*fast*—the place to call is your local Danly Branch.

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STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

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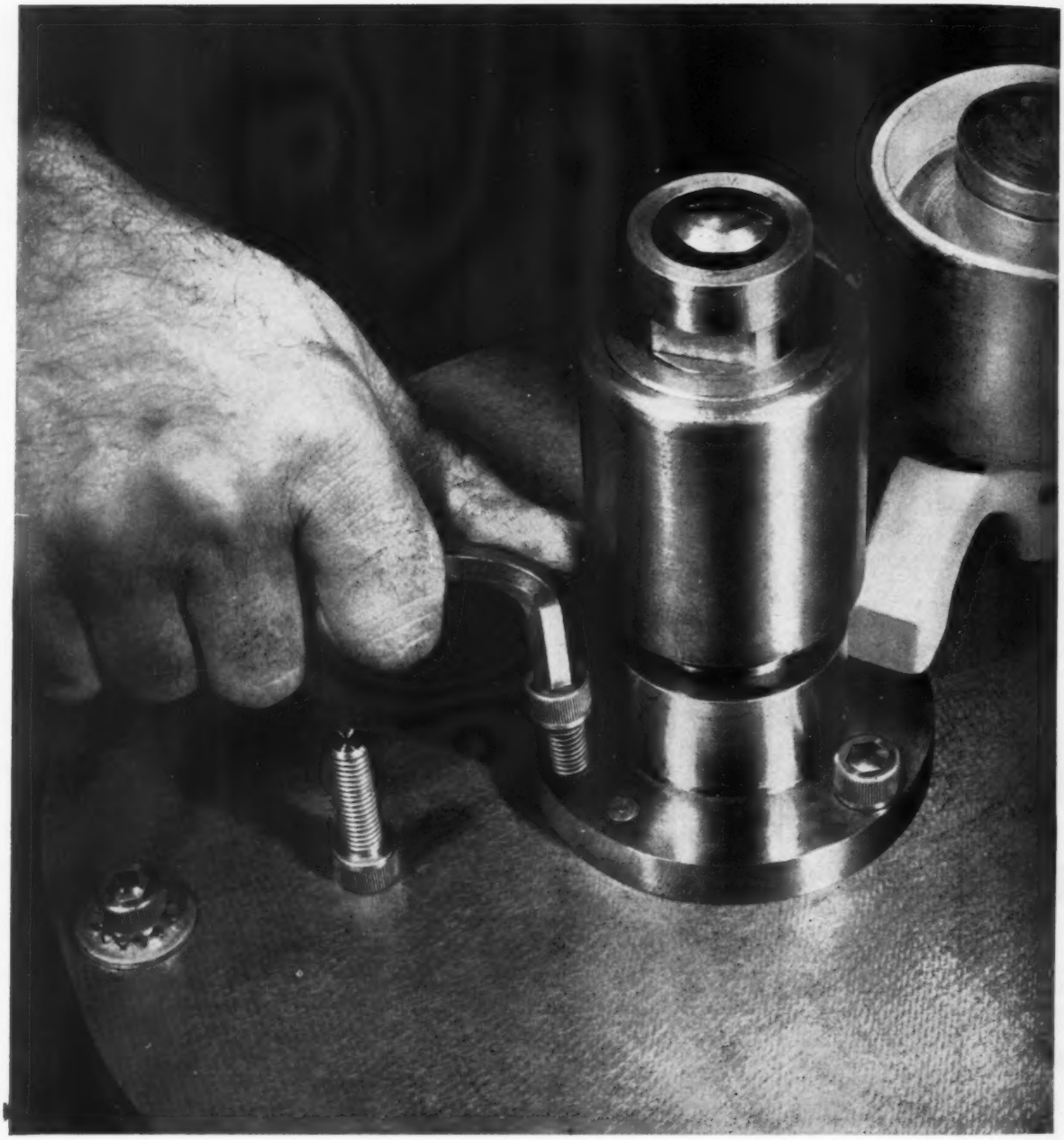

WHY USE A PLATED UNBRAKO SOCKET SCREW? Accuracy of the plated screw —Class 3A thread tolerance after plating. And prompt delivery—shipment of plated UNBRAKOS 7 days after receipt of your order. It is this unique control of quality and delivery that enables us to supply plated UNBRAKO socket head cap screws for this precision centrifugal separator used in the dairy industry. The story of plating at SPS is told in an interesting booklet, "Precision Plating—a product and a service." For a copy, see your authorized industrial distributor or write us on your business letterhead. STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

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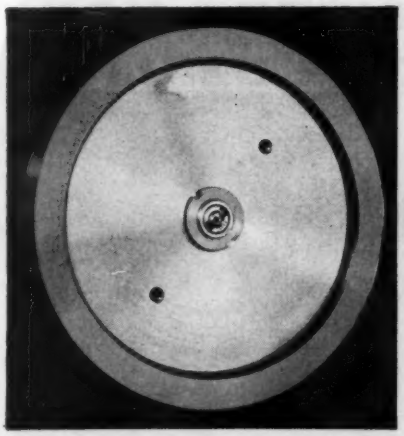

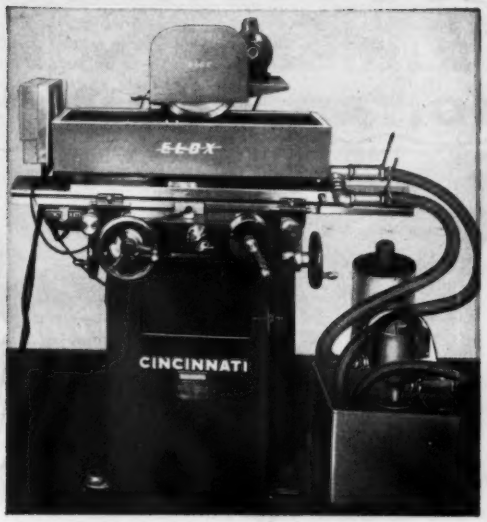

100% more pieces per grind
300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing **Elox will guarantee increased tool productivity over any type of abrasive grinding.**

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

elox* *corporation of michigan*

****Comprehensive report and company name given on request.**
***T. M. Reg.**

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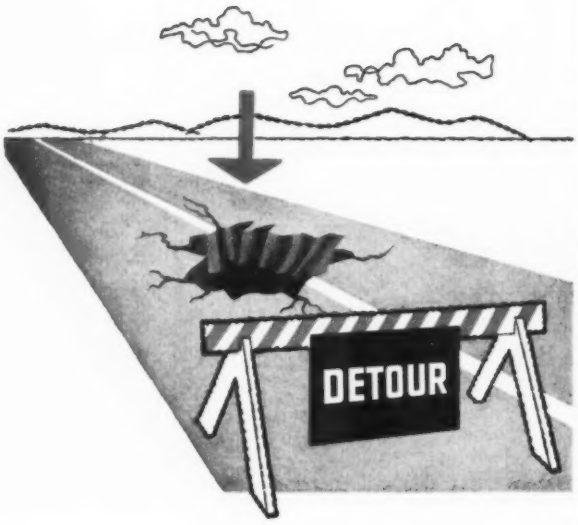


a hole here wastes time . . .

a hole here saves time

Crucible Hollow Tool Steel Bars save time — and money too — whenever you need ring-shaped steel parts, or tools with a center hole. The tool steel is drilled through when you get it! You don't need to bore, drill, hole-saw, cut off or rough-face. That's why they cut your production time, increase machine capacity — and reduce scrap losses.

You can get these hollow bars in any of Crucible's famous quality tool steels, in almost any combination of OD and ID sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening; SANDERSON water-hardening; AIRDI 150 high carbon, high chromium; AIRKOOL air-hardening; and NU DIE V hot-work tool steels — from the Crucible warehouse near you.

Call your Crucible representative for the full story of how these steels can save time and money in your shop. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

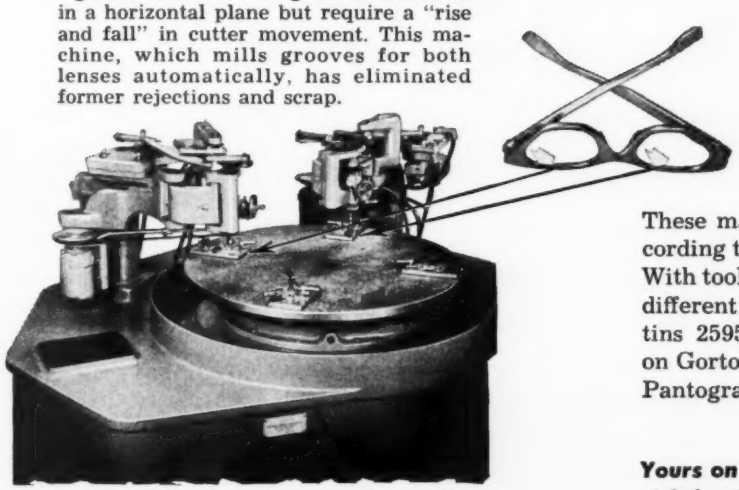
CIRCLE INFORM-A-GRAM KEY NO. 8

MULTIPLE OPERATIONS

HIGH PRECISION NOW POSSIBLE IN VOLUME PRODUCTION OPERATIONS

240 PIECES PER HOUR
This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

194 PIECES PER HOUR
These die-cast spectacle frames have V-shaped bezels or grooves for left- and right-hand lenses. The grooves do not lie in a horizontal plane but require a "rise and fall" in cutter movement. This machine, which mills grooves for both lenses automatically, has eliminated former rejections and scrap.



Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counter-boring, grooving or routing.

Infinitely variable feeds up to the capacity of any existing cutter. Reversing drive for conventional or climb milling.

These machines are custom-built according to your specific requirements. With tooling changes, they have many different applications. Write for Bulletins 2595-DS 1207 and 2604-DS 1207 on Gorton Multiple-Spindle Indexing Pantographs.

Yours on request.
Ask for Catalog 1655-1207.

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SINCE 1893

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1207 RACINE ST., RACINE, WISCONSIN, U.S.A.

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A 8383

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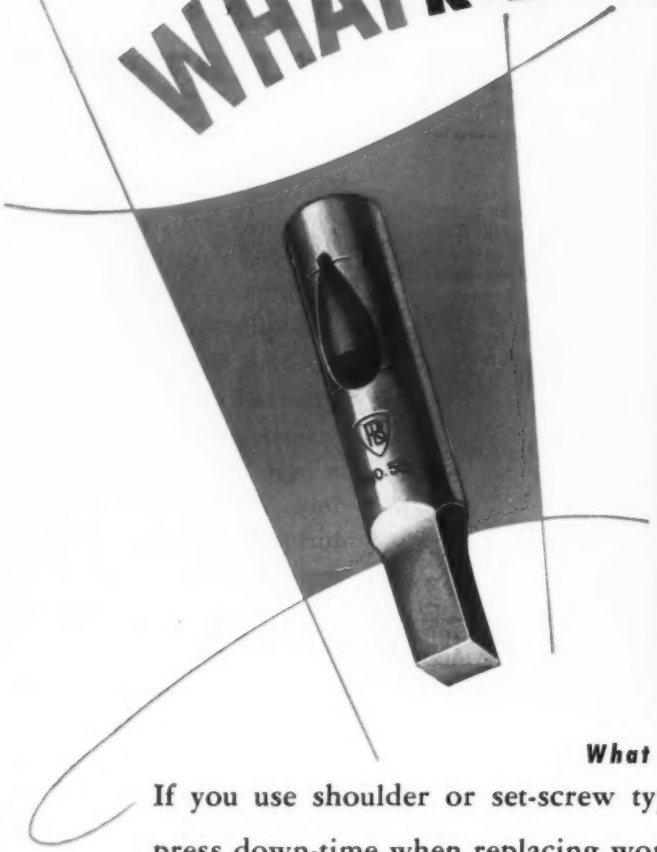
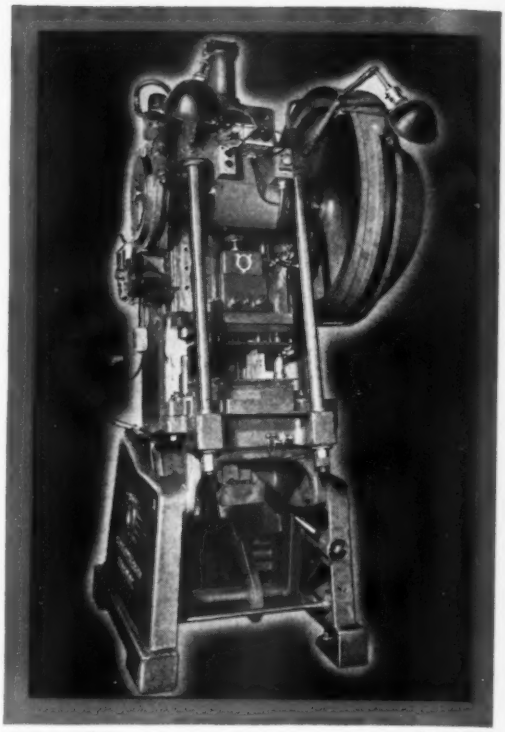
WHAT R-B PUNCHES SAVE...





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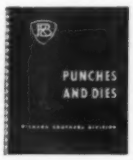
If you use shoulder or set-screw type punches, you have excessive press down-time when replacing worn or broken punches.

But, with R-B interchangeable and standardized punches and die buttons you get quick insertion and removal in the press. The R-B ball lock features, that assure positive radial alignment and vertical locking without further keying, permit greater press utilization.

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 72 - 12635 BURT RD. - DETROIT 23, MICH.



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COMPANY_____

ADDRESS_____

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STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES
MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

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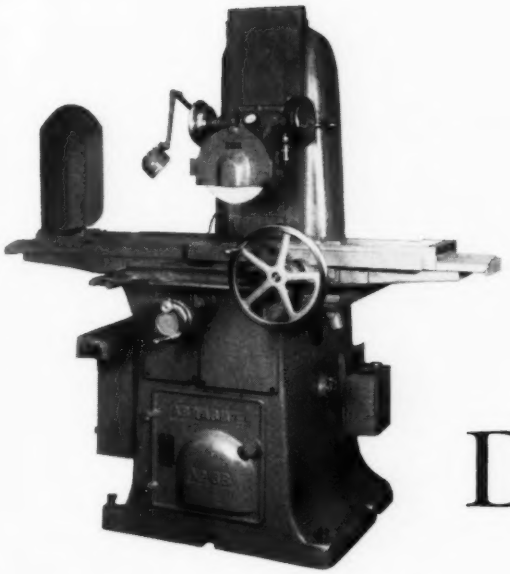

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May we give you the facts . . .

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ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO.
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Please send catalog describing Abrasive 3B and M3 Surface Grinders.

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Company.....

Address.....

.....

.....

CIRCLE INFORM-A-GRAM KEY NO. 11

How to get the type of bushings you want in *your* die sets

Best way to get the quality die sets you want *plus* the type of bushing and pin assembly you prefer is to stamp "USE DETROIT DIE SET" on your blueprints. For here, along with a *full-value* die set, you have a choice of a dozen different bushing assemblies. For instance, the new *self-oiling bushings* that automatically lubricate friction surfaces. And then such types as *ball-bearing assemblies, Lamina bronze-plated bushings* with or without clamps, and solid *Ampco bronze bushings* with Alemite fittings.

For precision die work, specify a precision Detroit Die Set with the type of bushing that answers your specific needs.

Detroit
DIE SET
CORPORATION

Offices in Principal Industrial Centers

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

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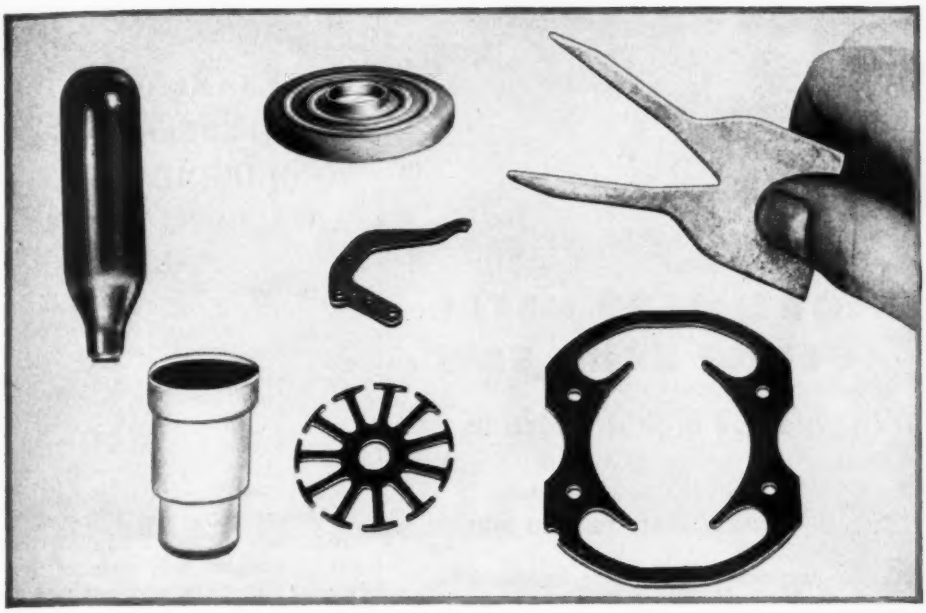
Large or small,
simple or complex . . .

Carboloy carbide-equipped dies outproduce steel 10 to 50 times



Typical parts produced faster, and at less cost, with Carboloy carbide-equipped dies. These carbides are supplied rough-finished or, where desired, precision-finished, for application by you or your diemaker.

FROM SIMPLE notching dies to complex lamination dies, Carboloy® cemented carbides bring users from 10 to 50 times more production.

Dies equipped with Carboloy carbides cut maintenance and downtime costs . . . produce burr-free, close-tolerance parts.

These carbides have proved their over-all efficiency on hundreds of drawing, forming, blanking, and piercing jobs. And, in every case, brought spectacular production increases . . . at lower cost.

Carboloy engineers are ready to work with you or your diemaker on the design and application of carbide dies. For more information on Carboloy cemented carbides, write, or send coupon, today.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

Carboloy Created-Metals for Industrial Progress

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☐ Send me Carboloy Die Engineering Manual D-124.
☐ Send complete details on Carboloy Die Training School.
☐ Have a Carboloy Field Engineer call at my plant.

Name_____ Title_____

Company_____

Address_____

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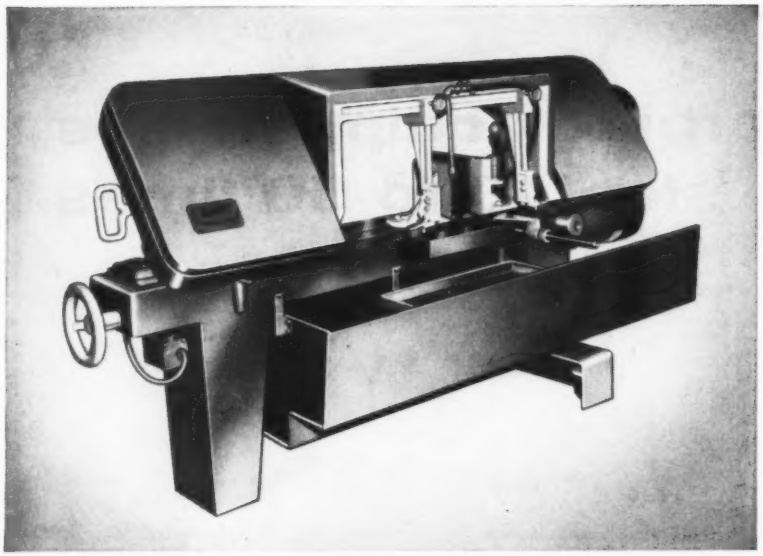
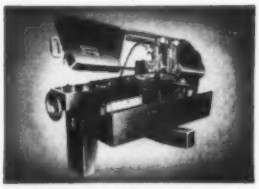


KALAMAZOO

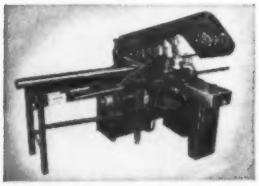
MODEL 1220 METAL CUTTING BAND SAW

big, fast, built to give you high production

KALAMAZOO METAL CUTTING BAND SAW MACHINES . . . a model to meet your needs.



MODEL 8C cuts 8" round, 16" flat, 8" pipe. Coolant equipment and casters available.



KALAMATIC BAR FEED ATTACHMENT converts *Kalamazoo* saws to fully automatic cut-off machines.

MODEL 610 cuts 6" round, 10" flat. Coolant equipment and casters available.

CUTS 12-INCH ROUND, 20-INCH FLAT, 12-INCH PIPE

Accurate to a few thousandths, with minimum burr and kerf.

Four cutting speeds and variable frame weight adjustments provide a selection for various jobs — better sawing results, longer blade life.

Available with coolant equipment for uninterrupted production sawing — without coolant for intermittent cutting and for non-ferrous metals.

Designed throughout for maximum safety. All moving parts fully enclosed — only cutting section of saw blade is exposed.

Heavy duty 1 HP motor provides ample power for all cuts.

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CIRCLE INFORM-A-GRAM KEY NO. 14

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

GOVERNMENT RADIO INTERFERENCE REQUIREMENTS FOR MACHINE TOOLS*

by L. W. Thomas

Radio Interference Consultant
Bureau of Ships
NAVY DEPARTMENT

Since the inception of communications by "wireless" in 1902, there has been and still is a shortage of space in the radio frequency spectrum for the many stations and services that would like to occupy portions of this spectrum.

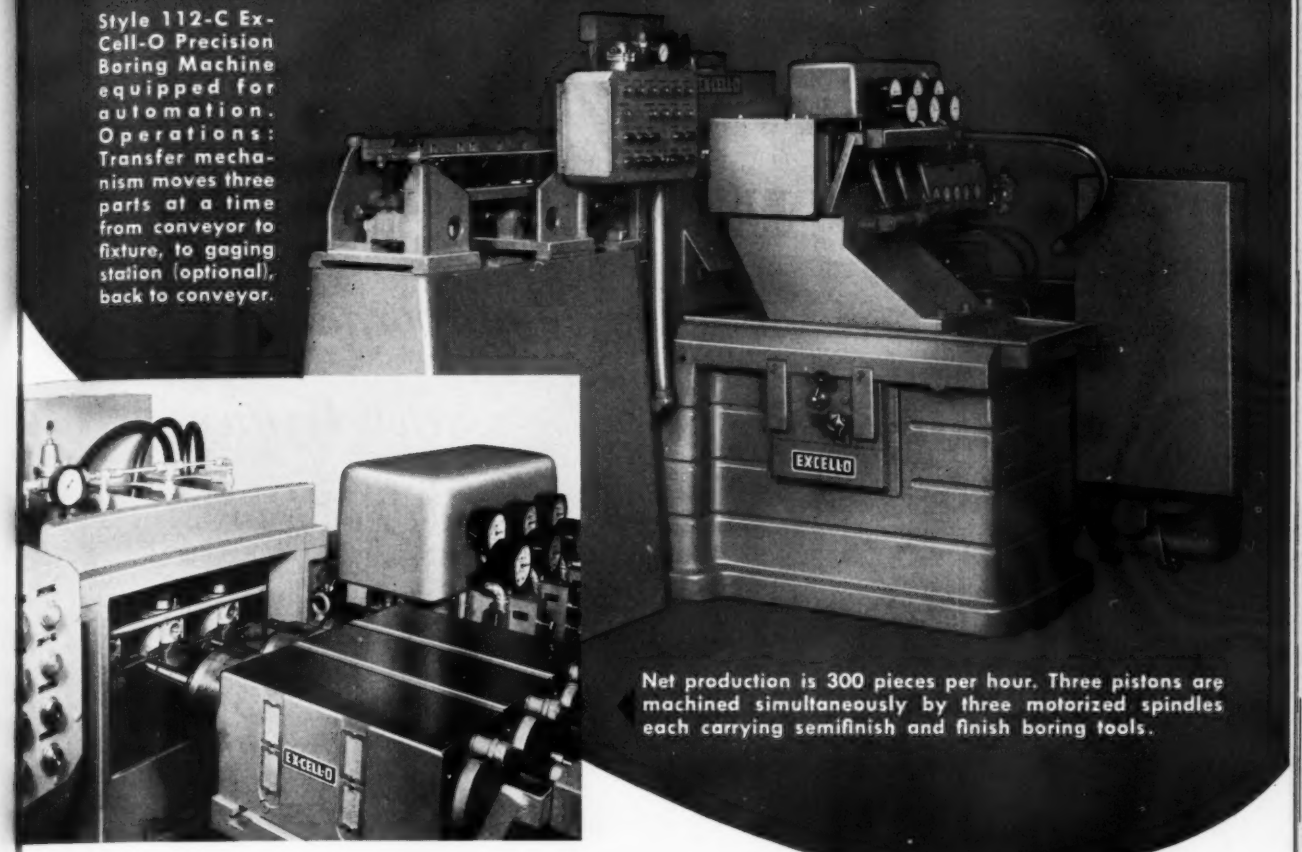
The radio frequency spectrum is a public domain which must be conserved as we now conserve our mineral resources, forests, streams and farm lands. The broad responsibility for this job is assigned to the Federal Communications Commission. The greatness of this job may be understood when we find that radio communications, in some form or another affect the lives of nearly every person in the world. Some of these forms are: safety of life at sea and in the air; fire and police emergency services; communicating daily news across international borders; education and entertainment.

Radio interference — undesired electrical energy which causes malfunctioning in other undesirable response of electronic equipment or systems — is like the signal from a radio transmitter in that it occupies space in the radio frequency spectrum. The radio receiver tuned to the

. . . *Contnued on page 18*

*Presented at the 19th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation.

Style 112-C Ex-Cell-O Precision Boring Machine equipped for automation. Operations: Transfer mechanism moves three parts at a time from conveyor to fixture, to gaging station (optional), back to conveyor.



Net production is 300 pieces per hour. Three pistons are machined simultaneously by three motorized spindles each carrying semifinish and finish boring tools.

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Call your Ex-Cell-O representative or write Ex-Cell-O in Detroit for complete facts on this or similar production savings opportunities through automation.

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CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk, from page 14

radio transmitter, will also receive radio interference if the interference occupies the same space in the spectrum as the radio transmitter. Radio interference did not become important until its strength approached the strengths of desired signals from radio transmitters.

Just as the television picture in your home sometimes becomes distorted or streaked with dark and light bands due to interference in one form or another, so might the ground-controlled-approach system at your local airport suffer from the same interference, but with more serious results. Instead of some viewers being inconvenienced by losing part of a television program, the ground control operator may give incorrect instructions to the plane coming in for a landing. In this instance the safety of many lives may be at stake, and millions of dollars worth of property and equipment may be a total loss.

Instances of radio interference to radio communications are the subject of many complaints to the Federal Communications Commission. Engineering examinations of many of these complaints reveal that radiations from many items can be used as targets for guided missiles. They can jam air-to-ground and ground-to-ship communications and thereby render them useless. They can reveal the location of electrical and electronic equipment. They can cause mistakes in electronic computers.

The possible dangers of radio interference to the United States during a national emergency have been recognized, and to guard against such dangers, the 82nd Congress on October 24, 1951 approved Public Law 200 as an amendment to the Communications Act of 1934. This law provides that the President may, after proclamation that there exists war, or a threat of war, state of public peril, disaster or other national emergency, in the interest of national security or defense, suspend the rules and regulations applicable to any or all stations or devices capable of emitting electromagnetic radiations, and may cause the closing of any station for radio communications, or any device capable of emitting electromagnetic radiations between 10 kilocycles

and 100,000 megacycles, which is suitable for use as a navigational aid beyond 5 miles.

In the military, the Joint Chiefs of Staff recognized the devastating effects of radio interference on military communications. They stated that the success of military engagements depended upon the adequacy, effectiveness, and reliability of communications systems. These systems are susceptible, in varying degrees, to radio interference whether created by equipments of their own type, by other types of equipment employing electrical circuitry, or by natural or man-made disturbances. By subjecting communications equipment to radio interference, the attainment of military objectives and the lives of personnel are endangered. Two objectives were consequently laid down. First: to design electronic and communications equipments to be as immune as possible to radio interference; second: to make all equipments which were capable of creating radio interference as free of interference as the state of the art would permit. This general directive was given to the Army, Navy, and Air Force, and each service was made responsible for its own radio-interference problems.

In the Navy, new designs of electronic and communications equipments have incorporated the latest techniques to reduce the effects of radio interference. At the same time their sensitivities are being constantly improved. This is the accomplishment of the first objective. The accomplishment of the second depends upon the manufacturers and designers of the equipments that create the interference.

Certain types of machine tools are sources of radio interference to electronic and communications equipment when operated in the immediate vicinity. Under nonmilitary conditions, some degree of relief from this interference may be obtained by moving the electronic or communications equipment away from the source of interference. This may be possible on many land-based military installations, but aboard ships or on aircraft it is a little difficult. The next best thing for us to do is to reduce the radio interference to the electronic or

. . . Continued on page 24

NOTICE

The New

SIBLEY MODEL D DRILLING MACHINES in 24" and 28" SWING

Gain greater productivity and operator efficiency—with V-belt drive direct to a 4-speed geared transmission, controlled by a conveniently located lever. 4-station switch at front of machine includes an "inching" button for easy change of speeds.

25" head travel on hand-scraped column; 11" spindle feed; 1-3/4" drilling capacity in mild steel. The heavy table arm assures rigidity and swings on column, to make the machined base accessible for a working surface.

Standard equipment includes automatic spindle stop; geared power feeds; back gears.

Model D-24 Drilling Machine is illustrated complete with coolant pump and fittings, electrical reversing, 5 H. P. motor, magnetic starting switch, and rectangular oil groove table.

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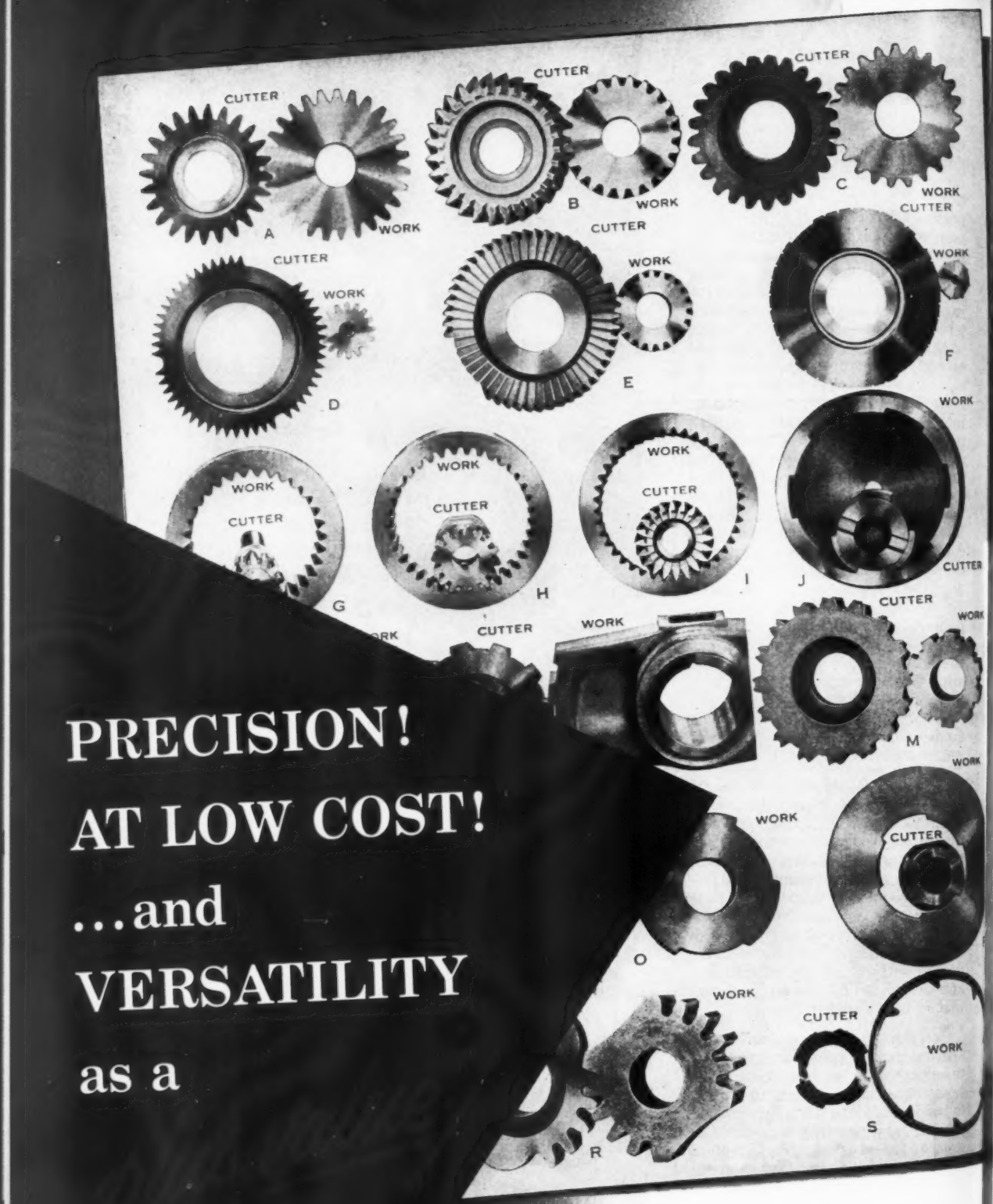

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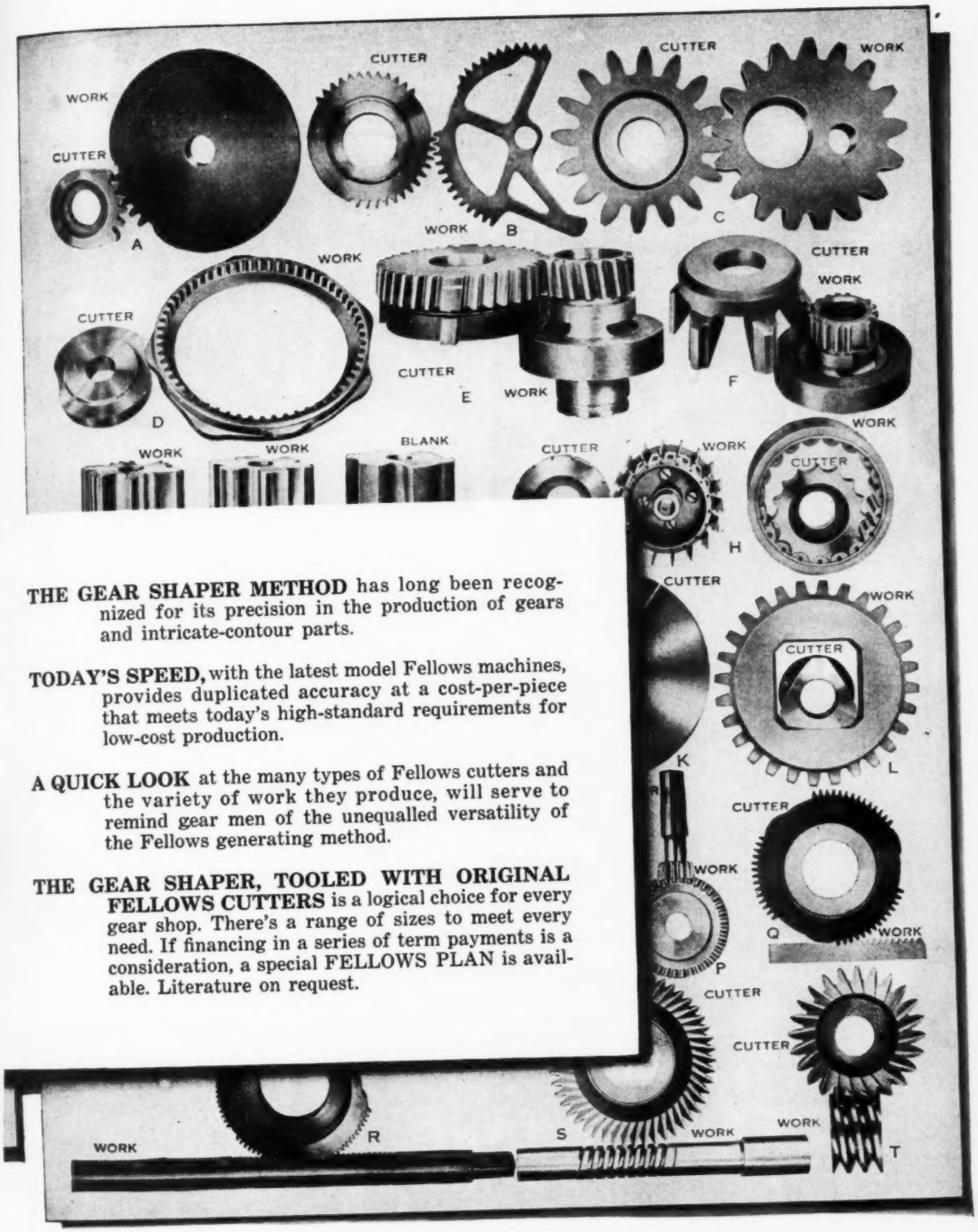

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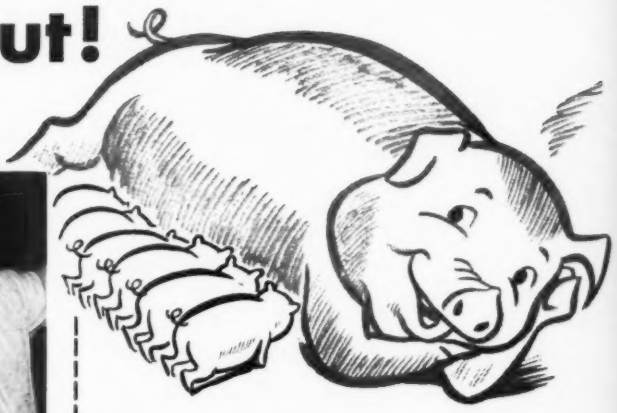

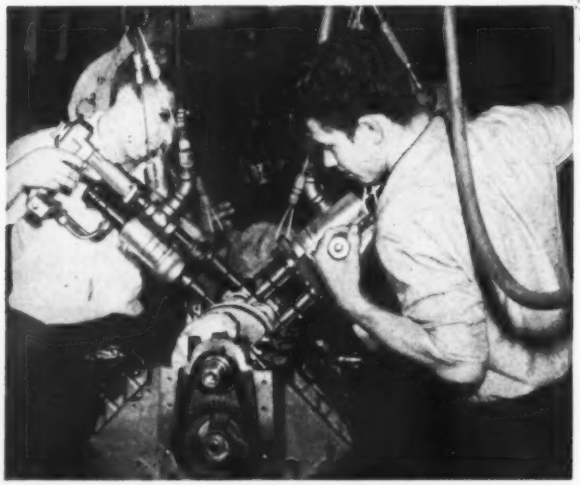

2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

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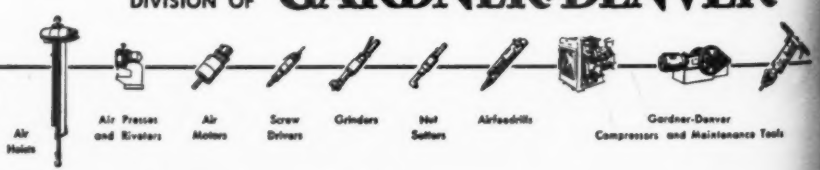

CIRCLE INFORM-A-GRAM KEY NO. 22

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FLASH! HIGH-SPEED STEEL CLAW-TOOTH SAW BAND . . . now available for the first time—an exclusive DoALL development! Now cut steel up to 6 times faster with up to 10 times the blade life of any previous saw band—use safe DoALL Demon High-Speed Steel Claw-Tooth Bands! Performance is sensational! Get the facts—Call or write DoALL today.

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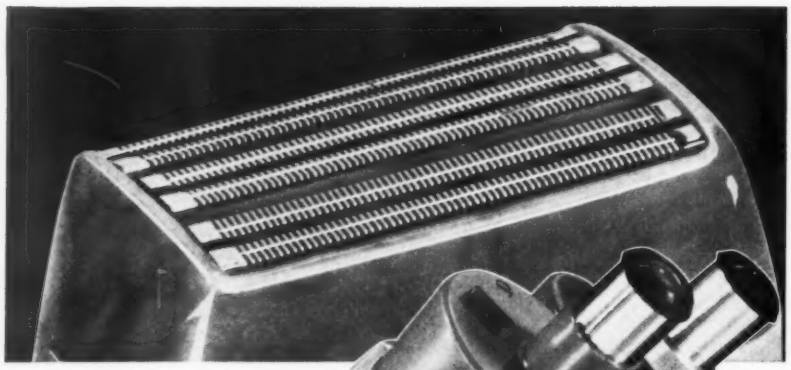

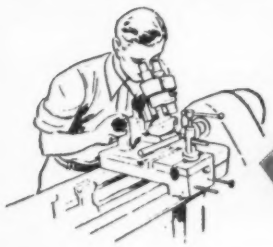

Remington Rand has solved the problem of critical inspection with Bausch & Lomb Stereomicroscopes. And it's done with an increase in production. Clear, sharp, magnified views of shaver head—with natural depth perception—quickly reveal flaws such as tiny cracks, bent blades, burrs, contact between cutter and head. Increased operator comfort, higher efficiency, keep peak production rolling.

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CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk, from page 19

communications equipment by making less interference. This can be done in several ways.

One is to so revise interference causing equipment so that all sources of radio interference are eliminated or attenuated. All too often, this is the only method tried, and the results are not always fully satisfactory. Interference producing items that have been subjected to radio-interference reduction measures sometimes get to look like Christmas trees because of all the extras hung on them. Service or maintenance on one of these items is almost impossible. You will never get all these extras back in place. If you do not, then the degree of freedom from interference that was previously incorporated into the equipment will not be duplicated.

Another approach to the reduction of interference from an offending item is to examine its basic design and to determine whether changes can be made in it, possibly by using components or circuitry that will produce less interference. For instance, if an electric motor is required in a piece of equipment, and the equipment is to be powered by alternating current, why not use an induction motor which is interference-free rather than a commutator-type motor which creates high levels of interference? As another example, if the offending equipment includes many contact-making devices such as relays and switches, and individual treatment of each source of interference is not feasible, why not investigate the possibility of using the metal case around the device or equipment as its own shield, and also include adequate power line filters at the point of entry of the power leads into the shielded enclosure? Or, if the source of interference is the control circuit of a large automatic machine tool, incorporating thyratrons, relays and switches, gaseous rectifier tubes, and a radio-frequency oscillator, why not use the metal protection around these electronic parts as shields, ground the shields to the chassis of the electronic or electrical units, and bond this chassis to the frame of the machine tool? Also, the leads to limit switches and push button controls can be

. . . Continued on page 26

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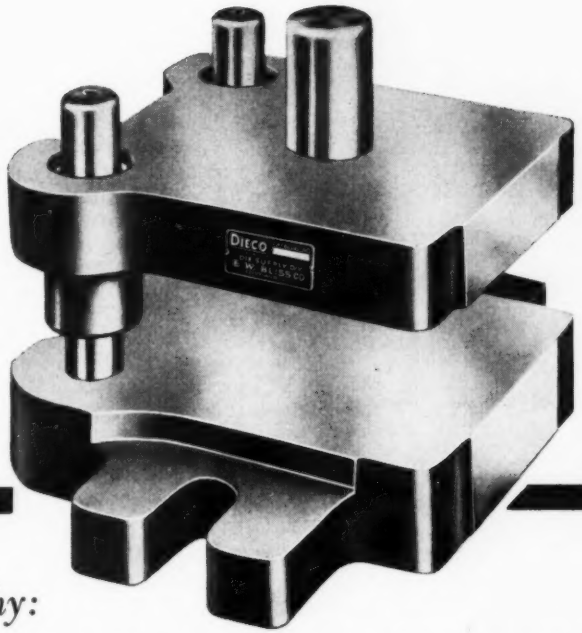

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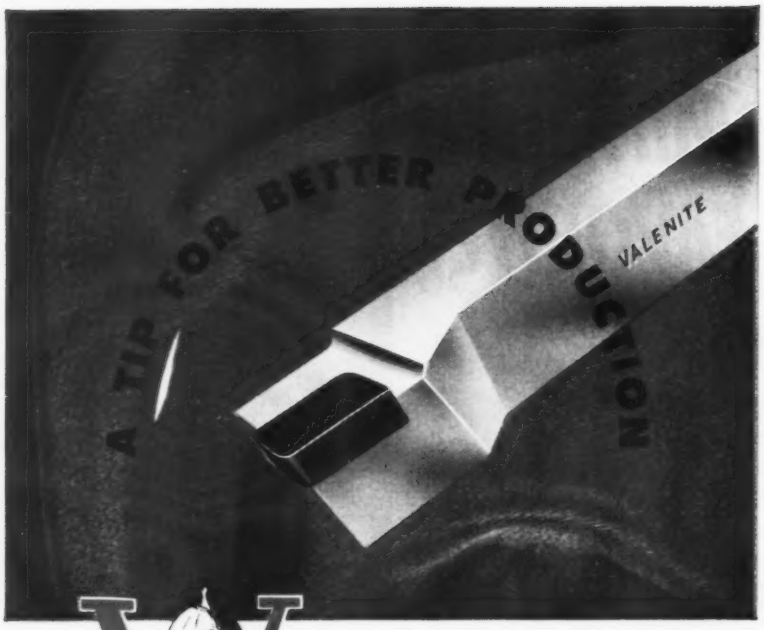

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CIRCLE INFORM-A-GRAM KEY NO. 26

. . . Month's Talk, from page 24

cased in flexible shielded conduit so that interference is not radiated. By so doing, the electric wires will also be protected from the harmful effects of oil, grease, and friction with consequent longer life.

As an example of the Navy's radio interference requirements, suppose we take the case of a 10-inch lathe. It is powered by a ½ or ¾-horsepower, single-phase or three-phase, 60-cycle a-c induction motor. The motor is controlled by a "forward—off — reverse" manually-operated switch. The electric motor has neither brushes nor commutator, and no automatic operations are involved. This lathe may be installed safely anywhere without causing radio interference to electronic systems or equipment. The Navy does not want machinery builders to perform radio-interference tests on this machine, nor on its motor or switch. Instead, all the Navy wants to know is what type motor and switch is being used. With this type information, it can be quickly decided that the lathe conforms with the requirements for the reduction of interference, that further proof is not necessary, and that no radio-interference tests are to be performed.

As another example, suppose this same lathe is to be used aboard one of our Navy ships that still has direct current. This would mean that the motor instead of being an a-c motor, would have the same horsepower rating, but would operate from direct current. In this instance, the Navy would require evidence that the lathe manufacturer has purchased d-c motor that is interference-free to the prevailing specification requirements, or that the lathe manufacturer has taken the necessary steps, supported by radio-interference test reports, to render the motor interference-free. Many manufacturers of d-c motors are in a position to make their motors interference-free or to make recommendations to bring motors within satisfactory limits. The Navy wants to know what these steps are and to what level the interference has been reduced before the machine is accepted for delivery.

. . . *Continued on page 28*

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CIRCLE INFORM-A-GRAM KEY NO. 27

So easy, inexperienced help become

SKILLED INSPECTORS

in a single afternoon!

Speed production of precision parts with this simple, time-saving *optical* inspection tool. No complex set-ups, no holding fixtures needed for most work. With exclusive under-stage illumination you simply lay work on table—see accurately magnified silhouette at comfortable eye level. Performs equivalent of several different mechanical inspections in one quick, easy visual check. Instantly reveals costly production errors. Reads to .0001" with optional micrometer stage.

SEE FOR YOURSELF IN ON-THE-JOB DEMONSTRATION!

For full information and obligation-free demonstration, call your local Do-ALL Sales Service Store, or write: The Do-ALL Company, 254 N. Laurel, Des Plaines, Illinois . . . exclusive sales and distribution agents.

BAUSCH & LOMB
SINCE B&L 1853

Quality Control
INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 28

. . . Month's Talk, from page 26

It is not necessary to review recent trends toward the inclusion of electronic controls into certain types of machine tools. Such controls speed up work and improve the accuracy of the machine. They also reduce the manpower required for a given output from the machine. However, many of these controls and automatic devices are sources of radio interference to electronic equipments and systems, and should be made to conform with existing radio-interference reduction requirements. These controls may in turn be affected by other sources of interference. Some of these electronic control systems create as much radio-frequency power as a small radio transmitter, and if this radio-frequency power is not confined to the proper places within the machine many communications may be endangered. Fortunately, however, the techniques of reducing radio interference from radio transmitters and radio receivers have been well established, and it is only necessary to apply these techniques to the electronic systems now being incorporated into machine tools.

The Navy is trying to achieve a reasonable and effective degree of radio-interference reduction so that naval communications may be carried on in the vicinity of these machine tools. Our specifications for radio-interference reduction are constantly reviewed, and where these specifications can be relaxed, it is done immediately. Much of our communications equipment can tolerate extremely short bursts of interference of rather high levels provided the interference is not repeated too often. Our latest specifications relax the severity of interference reduction when the interval between recurrences of certain forms of interference is increased.

Only during the past year has considerable emphasis been placed on the reduction of radio interference from machine tools. In talking with many manufacturers and manufacturers' engineers, we have explained that our radio-interference reduction requirements are realistic and are not difficult to accomplish. We need protection for Navy communications, and when we have it we are satisfied.

. . . Continued on page 33

Olympic FM

DIE STEEL . . . used on

Roto-Flo Spline Rollers

SAE 1040 splines being cold formed.
Photo courtesy Michigan Tool Co.

Michigan Tool Co., Detroit, selected

Olympic FM for this severe cold forming application

On the new Roto-Flo Spline Rollers manufactured by the Michigan Tool Company, Latrobe's Olympic FM Die Steel has been specified for use in the cold forming racks shown above. This is a severe application involving heavy pressure to cold-form steel splines, serrations and similar shapes . . . an application that demands up to 150,000 production pieces before the racks are removed for regrinding.

Olympic FM . . . one of Latrobe's new free-machining high carbon-high chromium die steels . . . has proved extremely successful on long production runs of all types of tools and dies. In addition to long performance characteristics, Olympic FM yields a superior machined finish and easier machinability . . . factors resulting from the addition of alloy sulphides uniformly dispersed by the DESEGATIZED® process of manufacture.

For improved machinability and long production runs, order Olympic FM . . . over 250 sizes are stocked in ten conveniently located warehouses. Your order will be handled promptly and courteously.

BE SURE TO SEE THE **ROTO-FLO** IN ACTION!
MACHINE TOOL SHOW
Chicago—Sept. 6 thru 17th

LATROBE
STEEL COMPANY
Main Office and plant
LATROBE, PENNSYLVANIA

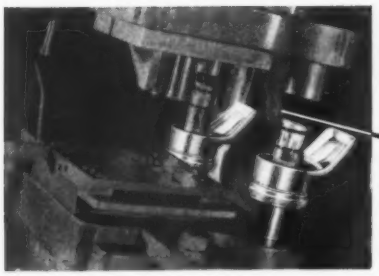
Branch Offices and Warehouses in principal cities

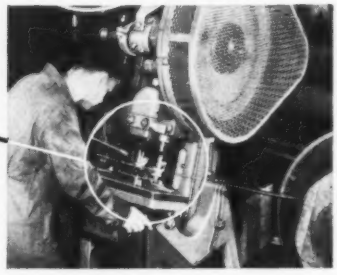
money saving

Accessories for your plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

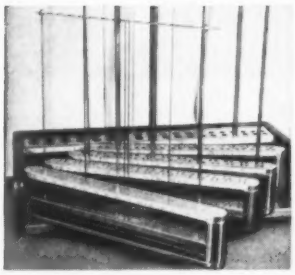
LEADER PIN OILERS

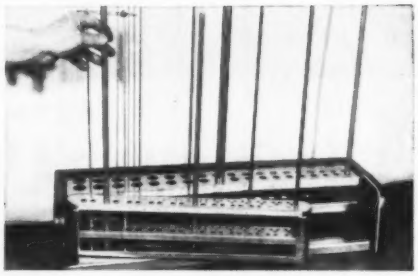




Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintain die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

DRILL ROD RACKS





Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.

Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to 1/2" and in 32nds from 1/2" to 1" included.

Also available in half size with fractions or numbers.

DIE SET PULLERS

The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. Available in three sizes.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin P-58

ACRO

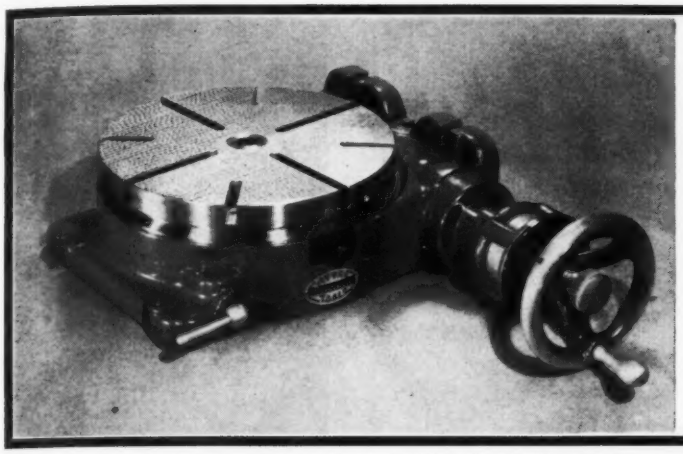
METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 30

For angular spacing jobs so precise you could never handle them before



A Rotary Table accurate to ± 3 sec. in 360°

(USING CHART)

No. 2 Moore 11-Inch Rotary Table, *developed by the builder of the Jig Borer and Jig Grinder.*

THE FOLLOWING ACCURACY BUILT FOR SHOP USE:

All points in 90° increments, from zero, ± 1½ sec.
All points in 18° increments, from zero, ± 2 sec.
All points in 2° increments, from zero, ± 4 sec.
Worm accuracy, ± 1 sec.
Repetition of settings, ± 1 sec.
4 sec. = .0001" on 10" dia.

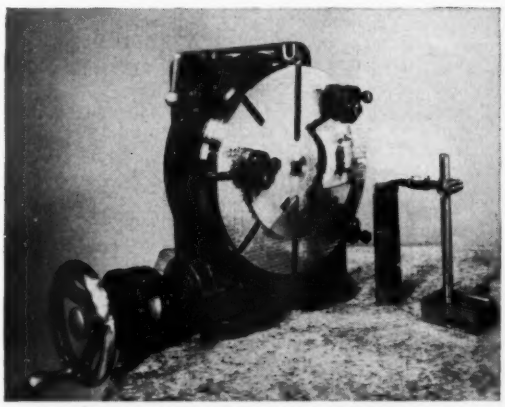
How many jobs have slipped by you because the angular spacing requirements were just too much for your equipment?

With Moore's new 11-Inch Rotary Table, you can easily handle the most precise angular measurements. Having an overall performance accuracy of ± 6 seconds throughout the entire 360°, this table is already being used successfully by several leading companies on government-sponsored precision jobs never before accomplished.

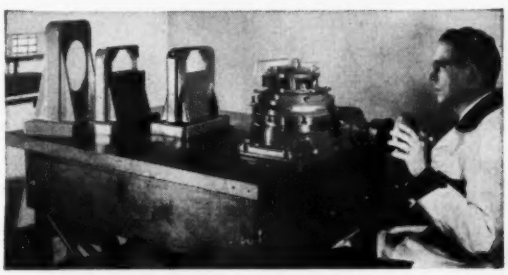
This extreme accuracy is achieved by a non-disengagable, thread-ground worm, combined with accurately spaced teeth of its mating gear. An ultra-sensitive method of angular measurement—interferometric inspection and calibration—used industrially for the first time, assures tooth spacing accuracy within less than ± 4 seconds.

You can use this rotary table for countless precision spacing applications on jig borers and jig grinders. Examples: Spacing holes in a circle on either machine; set at right angle for additional machining and inspection jobs; with its companion unit, the new No. 2 Sine Plate, to produce compound angle settings. Write today for Bulletin RT2.

MOORE SPECIAL TOOL COMPANY, INC.
726 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT



Accurate in vertical as well as horizontal position. Additional vernier permits normal reading even in vertical position.



Accuracy assured by interferometric inspection and calibration. This is the first time industry has used light-wave measuring methods for precise division of the circle.

ADD MOORE TOOLS (SPEED + ACCURACY) TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 31

HARDINGE
ELMIRA, N.Y.

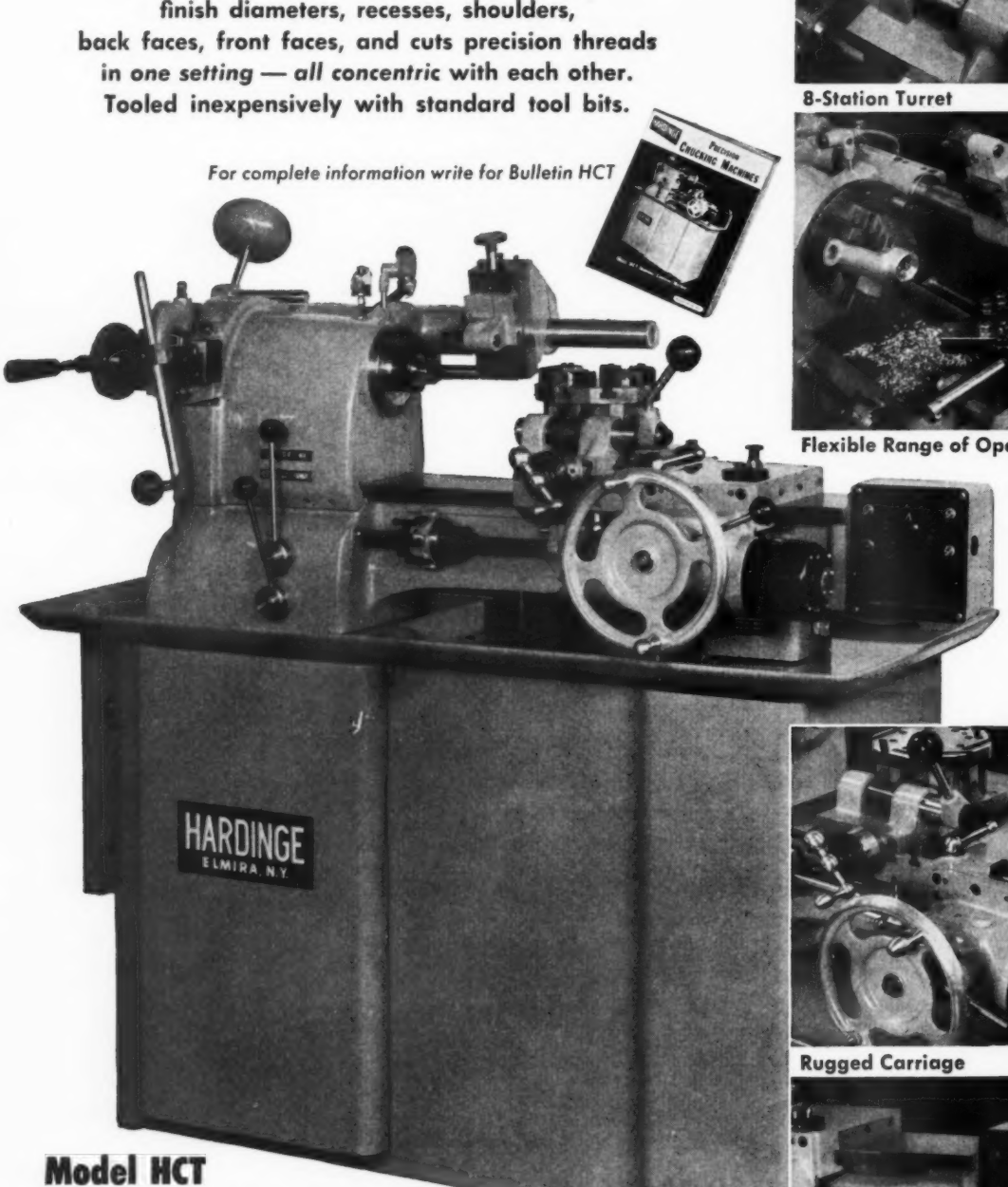
PRODUCTION
With Tool Room Accuracy

Hardinge Precision Chucking Machine HCT finish diameters, recesses, shoulders, back faces, front faces, and cuts precision threads in *one setting — all concentric* with each other. Tooled inexpensively with standard tool bits.

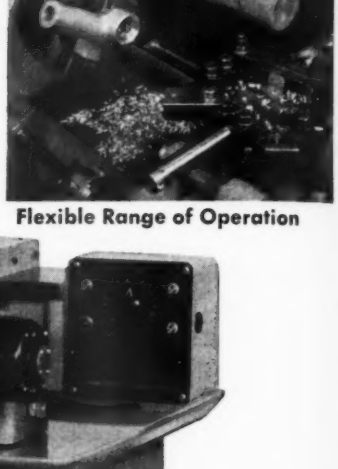
For complete information write for Bulletin HCT

8-Station Turret

Flexible Range of Operation



Model HCT
High Speed Precision Chucking Machine



Rugged Carriage

Independent Variable Carriage Feed

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Month's Talk, from page 28

A review of naval purchases of machine tools within the past year leads me to observe that approximately ninety percent of all purchases did not require radio interference tests. This is based on the fact that most of the items purchased were powered by a-c motors, with no automatic controls involved. Where limit switches are involved and infrequently used, they fall under the portions of the specification covering short duration interference. If such interference lasts less than one second and does not occur more than once every three minutes, it is not subject to requirements for the reduction of radio interference.

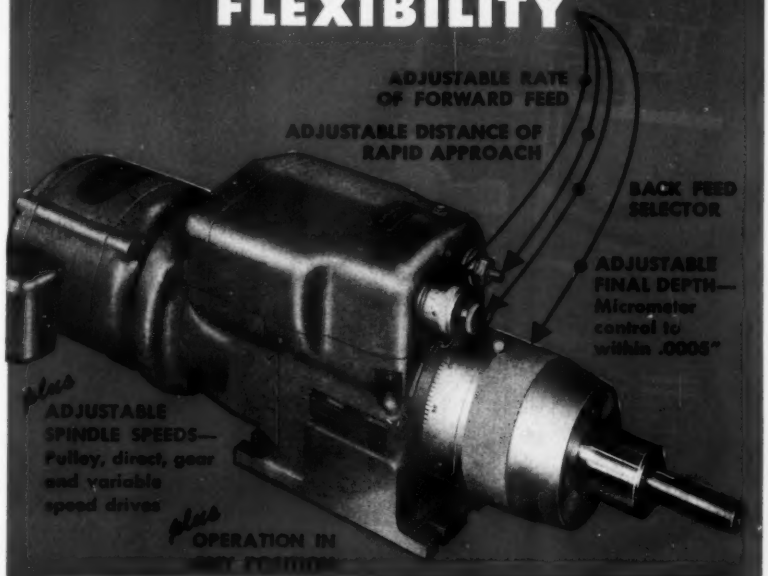
Since initial conversations with the machine tool industry in June 1954, considerable effort has been devoted to communicating with builders about solution of radio-interference problems. Letters have been mailed by the general manager of the NMTBA and many engineers have visited the Navy Department. These efforts will continue.

This will not permit lengthy review of our present radio interference reduction requirements. They are expressed in Military Specification MIL-I-16910A. Copies of it are available through any branch of the military. This specification was issued in August 1954, and enough technical information has already been accumulated to soon bring out another revision. This new revision will include measurement techniques for additional classes of equipment, and will prescribe how more accurate measurements of interference may be made with existing radio interference meters.

Many machinery manufacturers have asked, "Are there any cases where radio-interference specifications can be waived?" We do not like to use the word "waive." It implies, as far as the Navy is concerned, something that the manufacturer or contractor should do but is not doing, and would therefore justify reduction in the amount of money due the contractor. Therefore, we would rather, if any changes in the interference reduction requirements are concerned, call it an interpretation

. . . Continued on page 68

HARTFORD Special DRILL UNITS* have POWER PACKED FLEXIBILITY


ADJUSTABLE RATE OF FORWARD FEED
ADJUSTABLE DISTANCE OF RAPID APPROACH
BACK FEED SELECTOR
ADJUSTABLE FINAL DEPTH— Micrometer control to within .0005"
plus ADJUSTABLE SPINDLE SPEEDS— Pulley, direct, gear and variable speed drives
plus OPERATION IN

3 MODELS FROM ⅓ to 5 H.P.
TO GIVE COST SAVING PERFORMANCE
ON THESE OPERATIONS

Drill—Single and Multiple Spindle	Ream	Countersink	Bore
Deep Hole Drill	Spot Face	Outside Thread	Mill
Tap	Center	Hollow Mill	Face
	Chamfer	Counterbore	Recess

*Formerly produced under the trademark "Delta-Milwaukee" by the Rockwell Mfg. Company

Backed by the proven performance of thousands of units in hundreds of plants, the job flexibility and positive control of "Hartford Special" Drill Units make them a prime mover for any tool. Combined with "Hartford Special's" standardized machine components, they offer every manufacturer, regardless of size, the benefits of automatic production and the ability to switch from job to job at the lowest possible cost . . . Write for new catalog.

HARTFORD Special

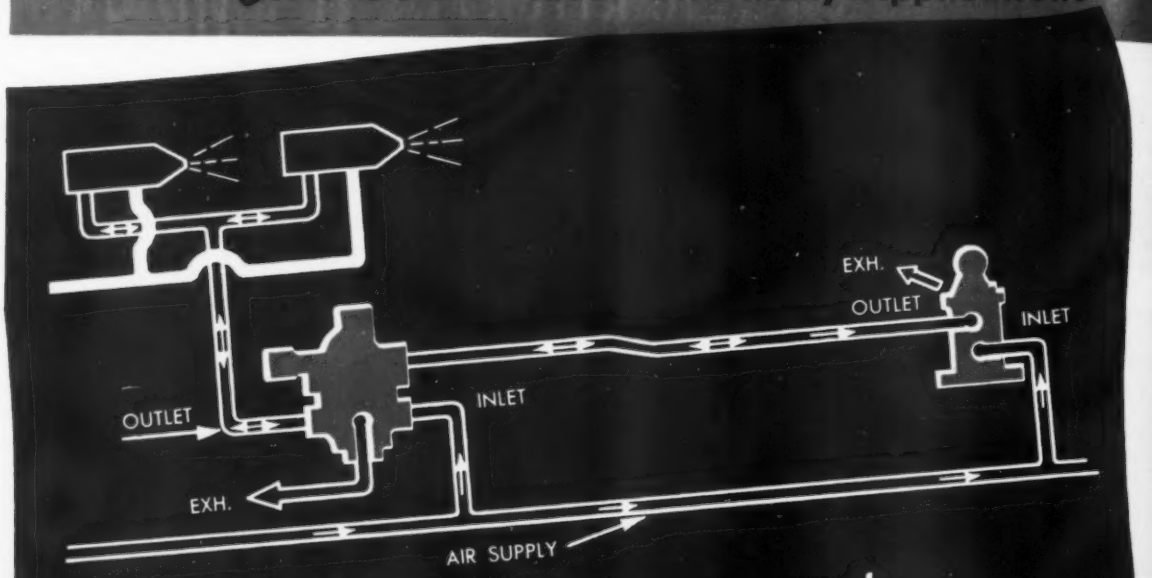
MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO. K-502-7
292 Homestead Avenue, Hartford 12, Conn.

☐ Please send me new Drill Unit catalog, with application Data Sheet.
☐ Please have Field Engineer call.

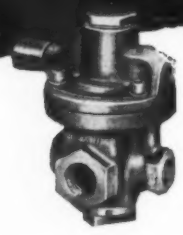
Name_____
Company_____
Address_____
City_____ Zone____ State_____

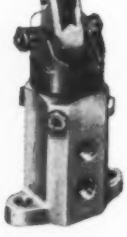
CIRCLE-INFORM-A-GRAM KEY NO. 33

A Ross *Airmation* Idea—with Many Applications



Sprays drawing compound with every press operation





- **Designed for spraying drawing compound on panels before stamping, but adaptable to any application requiring intermittent spraying or air blasting.**
- **Reduces manual work; assures precise quantity of fluid and accurate delivery.**
- **Spray is controlled by a Ross 3 Way Normally Closed WV Sequence Valve which is remotely controlled by a Ross Cam Valve.**
- **Amount of spray time can be varied by adjusting metering stem on valve.**
- **For assistance in engineering this Airmation idea to your application, contact your nearest Ross Service Engineer. He offers practical creative assistance.**

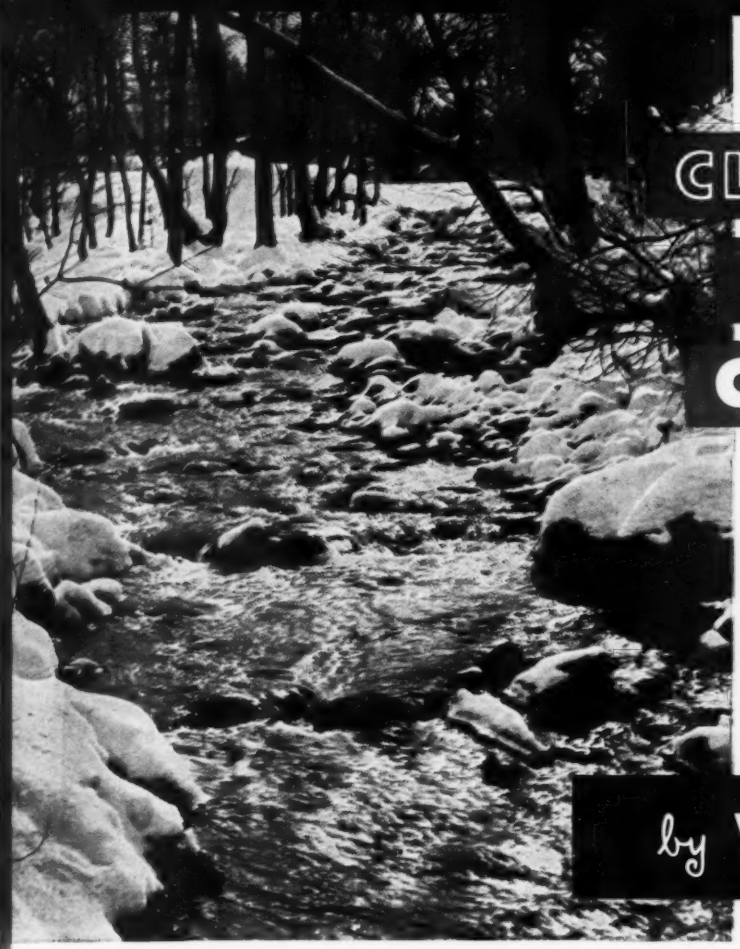
ROSS Control VALVES

Ross—The Bridle for Fast, Clean, Economical, Strong, Responsive Air Power

Ross OPERATING VALVE COMPANY

123 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 34



CLEAR COOL CLEAN

TRIPLE C* GRINDING COOLANT

by MOTCH & MERRYWEATHER

in either *liquid* or *crystalline* form

CLEAR. Triple C solutions are transparent and stable. You can watch the progress of your work. You will experience no foaming. With Triple C there is no emulsifying action on hydraulic or lubricating oils.

COOL. Uniform, complete wetting of metal provides maximum cooling. No steam or smoke; quicker, cooler, safer handling of work-pieces by your operator... *Results:* increased accuracy and higher production.

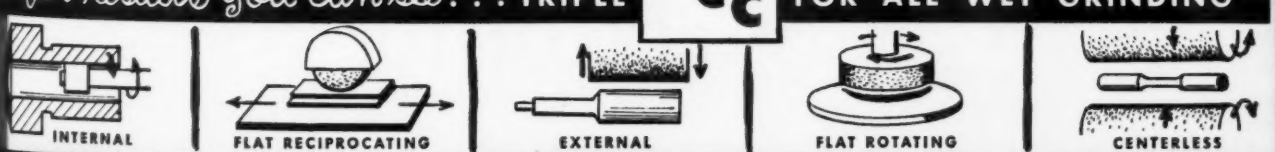
CLEAN. Grinding wheels stay clean and free-cutting. Fewer dressings reduce wheel cost. Clean machines remain free of caked residue. *Triple C on floors and clothing dries without residue or odor.* Filters do not clog.

The exceptional advantages of Triple C Grinding Coolant are available in either liquid or crystalline form. Triple C is the only coolant intended primarily for wet grinding which offers this option . . . Where shipping costs and storage space are not prime considerations, *Liquid* Triple C is frequently specified. Moreover, *Liquid* Triple C affords extra protection against rust and grinding odors . . . *Crystalline* Triple C saves space. Readily soluble, it possesses the clear, cool, clean qualities which are so desirable in a grinding coolant.

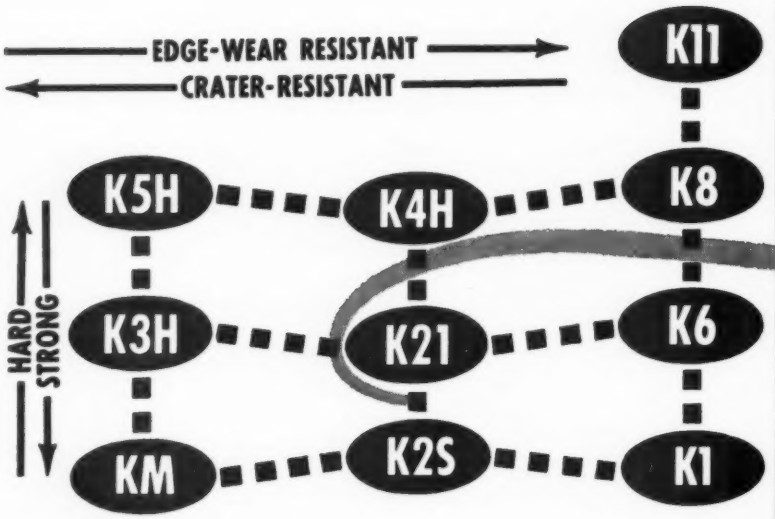
THE MOTCH & MERRYWEATHER MACHINERY CO.
CUTTING TOOL MANUFACTURING DIVISION
CLEVELAND 17, OHIO

*TRADE MARK

for results you can see . . . TRIPLE C FOR ALL WET GRINDING



TRIPLE C BRINGS A CLEAN DEAL TO YOUR MACHINES, OPERATORS, AND SHOP



Use Grade K21—the NEW Kennametal* General Purpose Steel-Cutting Grade

The Grade Selection Guide (above), which groups Kennametal grades according to strength, hardness, and wear characteristics, pinpoints the *new* K21 as a medium grade for general purpose steel-cutting applications. It is stronger than K5H, K4H, and K8. It has greater edge-wear resistance than K3H and KM, and more crater resistance than K11, K8, K6, and K1. Thus, K21 is for moderate, as well as heavy roughing of scaly, abrasive steel castings and forgings, and for interrupted cutting and milling operations requiring high resistance to edge wear, to cratering, and to shock. K21 shows exceptional performance on modern high-speed machines, and, due to its range, does an excellent job on older, slower-speed machines as well.

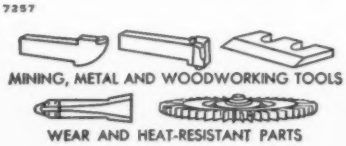
Because of this performance, K21 is rapidly becoming recognized as the leader of all general purpose steel-cutting grades. It's a premium grade at no extra cost. Ask your Kennametal Representative for performance facts; and for a copy of the Grade Selection Guide shown above . . . it's the most simple system of selecting the right grade for every job that has ever been developed.

Kennametal Engineers are ready to help you

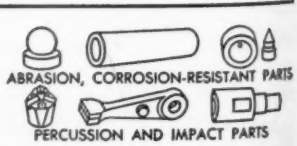
Every Kennametal Representative is a tool engineer. He is trained to help you analyze tool wear—apply the right tool and grade to the job—establish proper lathe speeds and feeds—train machinists to get increased production at the lowest possible cost with Kennametal Tools. In addition to his own broad experience, he has available to him the backgrounds of 150 other Kennametal Tool Engineers. His office is listed in the classified telephone directory in principal cities. Call him, or write KENNAMETAL INC., Latrobe, Pa.

*Registered Trademark

7257

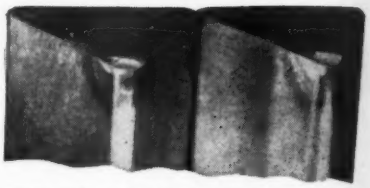


INDUSTRY AND KENNAMETAL ...Partners in Progress



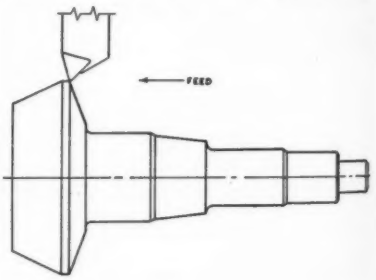
K21

Shows Exceptional Wear Resistance



Grade K21, on the left, shows less wear than competitive grade (at right) after turning 100 pieces.

Four competitive grades of cemented carbides were used in a recent comparative test machining SAE 4620 rear axle drive pinion forgings. (See drawing below.) Each grade was removed for examination of the cutting edge after turning 100 pieces. The competitive inserts showed sufficient wear to require indexing to a new cutting edge, while the Grade K21 insert (at left above) turned 200 additional pieces before it was indexed. This 3 to 1 ratio in tool life typifies the results being obtained on many types of machining jobs with this *new* Kennametal grade, including forgings, sandy castings, centrifugal castings, plate, weldments and highly abrasive silicon steels.



VISIT US AT THE MACHINE TOOL SHOW
Chicago, starting Sept. 6, 1955
Booths 410-411, Navy Pier, and
Booth 123, Chicago Amphitheater

CIRCLE INFORM-A-GRAM KEY NO. 36

YOU CAN'T BUILD TOMORROW'S PROFITS WITH YESTERDAY'S MACHINES

Modernize NOW with P&J

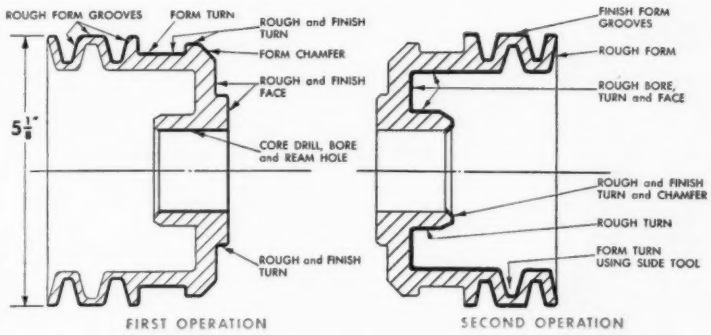
JOB FACTS:

PART . . . . Pulley

SIZE . . . . . Approx. 3¾" long x 5¼" Diam. (Rough Casting)

MATERIAL . . Cast Iron

OPERATIONS All surfaces rough and finish machined. Hole reamed. Twenty-five separate cuts in all.



SURFACES MACHINED ARE INDICATED BY HEAVY LINES

A very real problem that faced a large engine manufacturer was solved by installing MODERN EQUIPMENT. A Potter & Johnston Automatic provided the speed, power and versatility to meet their demands for fast, accurate, low-cost production. Tooling engineered by P&J Specialists took full advantage of combined cuts and faster-cutting carbide tools to reduce machining time to a minimum.

No, you can't handle today's . . . and tomorrow's . . . job requirements on yesterday's machines. Give yourself an extra margin of profit; modernize with Potter & Johnston Automatics . . . and with P&J Tooling. Start today . . . SEND FOR YOUR COPY OF BULLETIN NO. 154 — "34 Practical Production Ideas."

MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

LET P & J SHOW *You* THE WAY

THE MACHINE TOOL SHOW CHICAGO, ILL. SEPT. 6-17, 1955 INTERNATIONAL AMPHITHEATRE

...SEE US AT BOOTH 1219

POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

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DIVISION NILES-BEMENT-POND COMPANY

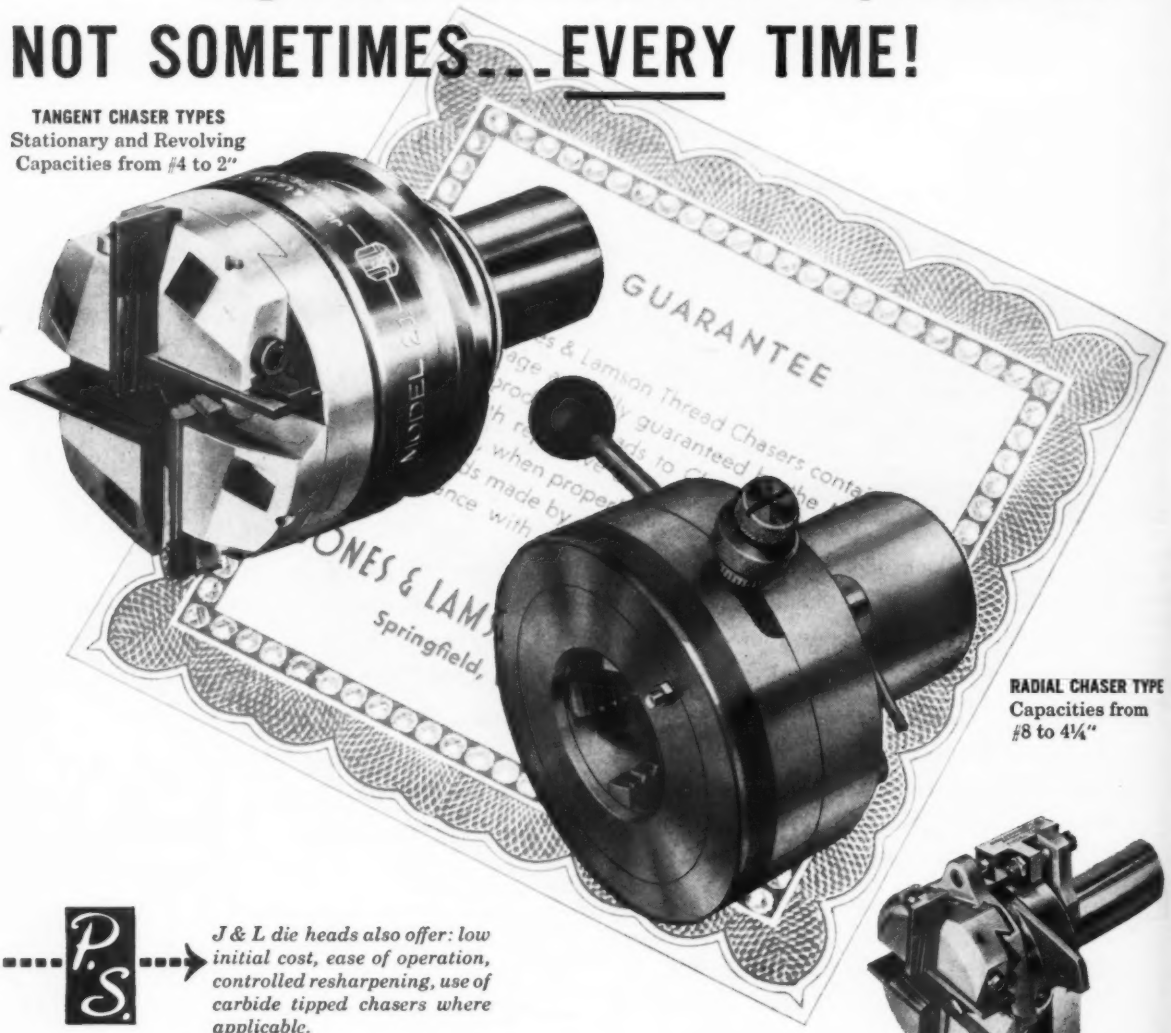
PRECISION PRODUCTION TOOLING P&J FOR MORE THAN FIFTY YEARS

CIRCLE INFORM-A-GRAM KEY NO. 37

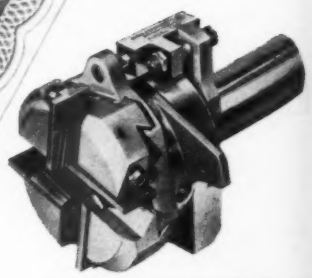
Jones & Lamson dies are your best buy . . . whether you need Class III or not. They give you extra savings because of our system of "no approximation" . . . a factor that also applies to Class I and II. So, whatever your requirements, Jones & Lamson's *written* Class III or better Guarantee means -----

IMPORTANT SAVINGS regardless of tolerance requirements — NOT SOMETIMES---EVERY TIME!

TANGENT CHASER TYPES
Stationary and Revolving
Capacities from #4 to 2"



RADIAL CHASER TYPE
Capacities from
#8 to 4¼"



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

P.S. *J & L die heads also offer: low initial cost, ease of operation, controlled resharpening, use of carbide tipped chasers where applicable.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

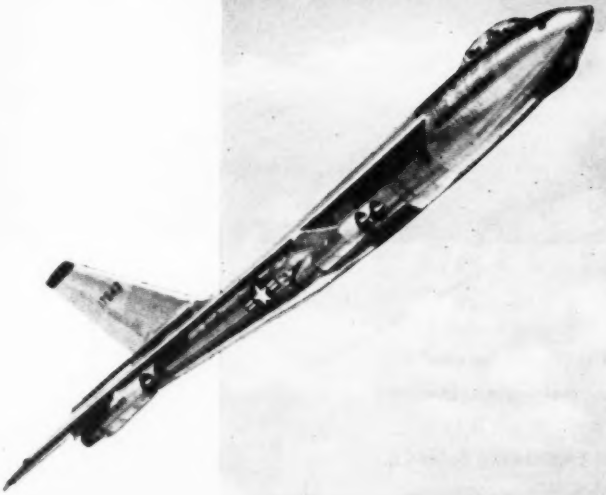
CIRCLE INFORM-A-GRAM KEY NO. 38

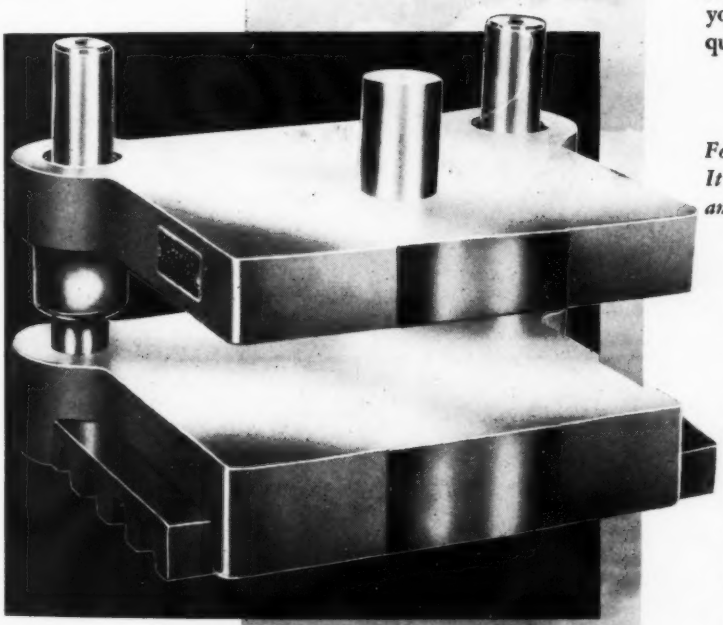
where **PRECISION** *is vital*

BOEING

like other American Industry relies on

SUPERIOR DIE SETS





The production of a modern jet plane is a complex operation requiring the maintenance of tolerances that were thought impossible only a few years ago. At the Boeing plants, the use of Superior Precision All-Steel Die Sets insures that the required standards are continually and efficiently maintained.

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SUPERIOR Die Sets are Custom Fitted to your individual needs. Made of high grade steel plate, with precision center marks and exclusive safety features, Superior die sets can provide the same guarantee of accuracy for your product and at the same time reduce your costs by cutting materially the time required for handling, assembly or disassembly.

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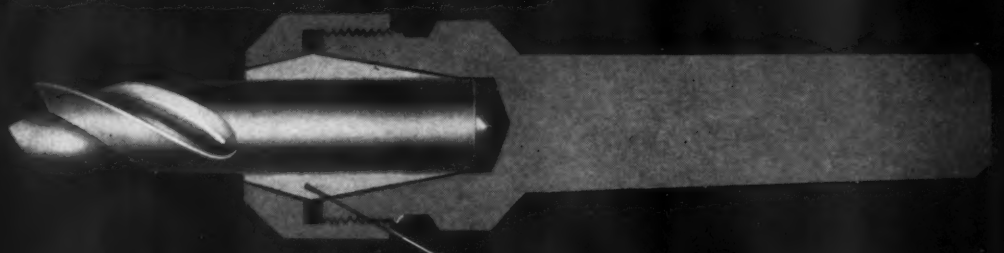
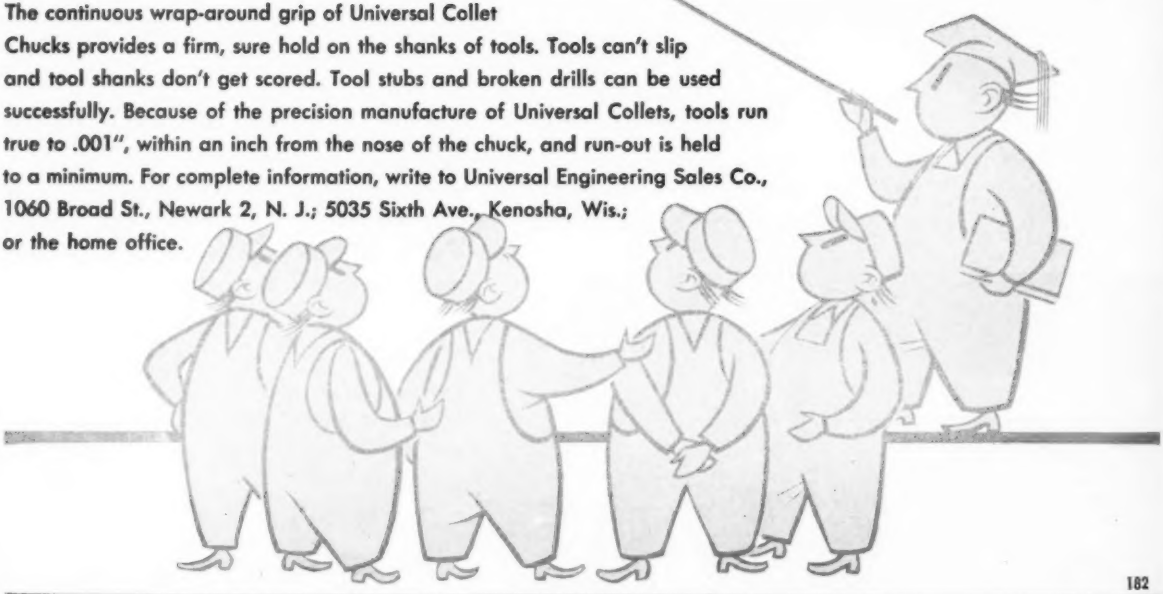
CIRCLE INFORM-A-GRAM KEY NO. 39

SIMPLIFIED DESIGN OF UNIVERSAL COLLET CHUCKS PROVIDE A SURER GRIP FOR LONGER TOOL LIFE



The continuous wrap-around grip of Universal Collet Chucks provides a firm, sure hold on the shanks of tools. Tools can't slip and tool shanks don't get scored. Tool stubs and broken drills can be used successfully. Because of the precision manufacture of Universal Collets, tools run true to .001", within an inch from the nose of the chuck, and run-out is held to a minimum. For complete information, write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.



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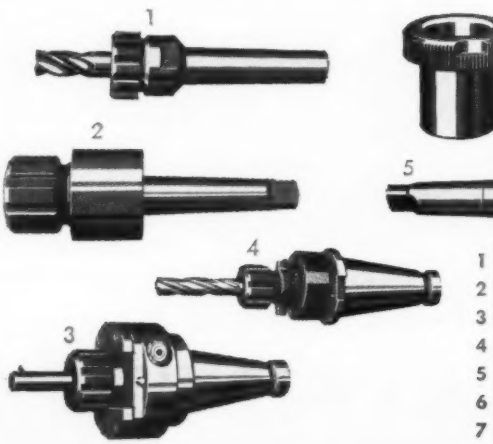
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY NO. 40

Will You Be There?

July 12-14. Western Plant Maintenance Show. 2nd Annual Engineering Show and Conference. Pan Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif.

•

July 28-30. National Tool & Die Manufacturers Association. Summer Board Meeting. King Edward Hotel, Toronto, Canada.

•

Aug. 22-23. Stanford Research Institute and National Industrial Conference Board. Symposium. Electronics in Automatic Production. Sheraton-Palace Hotel, San Francisco, Calif.

•

Sept. 6-17. National Machine Tool Builders' Association. Machine Tool Show. International Amphitheatre, Chicago, Ill.

•

Sept. 6-17. Production Engineering Show. Navy Pier, Chicago, Ill.

•

Sept. 6-17. Coliseum Machinery Show. Chicago Coliseum, Chicago, Ill.

•

Sept. 12-16. Instrument Society of America. 10th Annual Instrument-Automation Conference and Exhibit. Shrine Exposition Hall and Shrine Auditorium, Los Angeles.

•

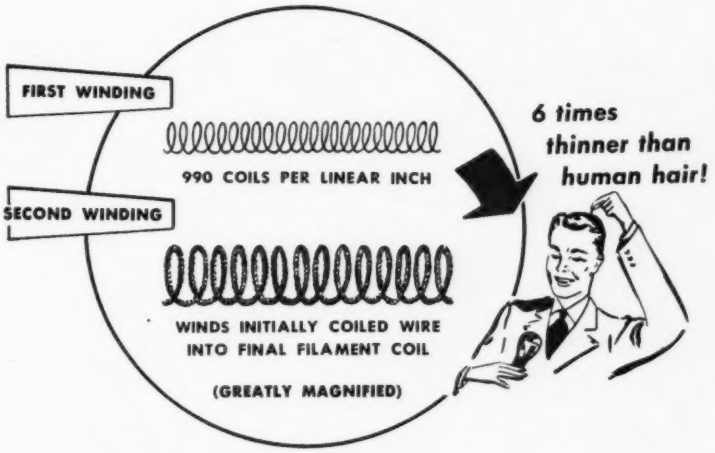
Sept. 15-18. Packaging Machinery Manufacturers Institute. Annual Meeting. Homestead, Hot Springs, Va.

•

Sept. 20-22. Society of Industrial Packaging & Materials Handling Engineers. 10th Annual Industrial Packaging & Materials Handling Exposition. Kingsbridge Armory, New York.

Protect Your Future

BUY U. S. SAVINGS BONDS TODAY

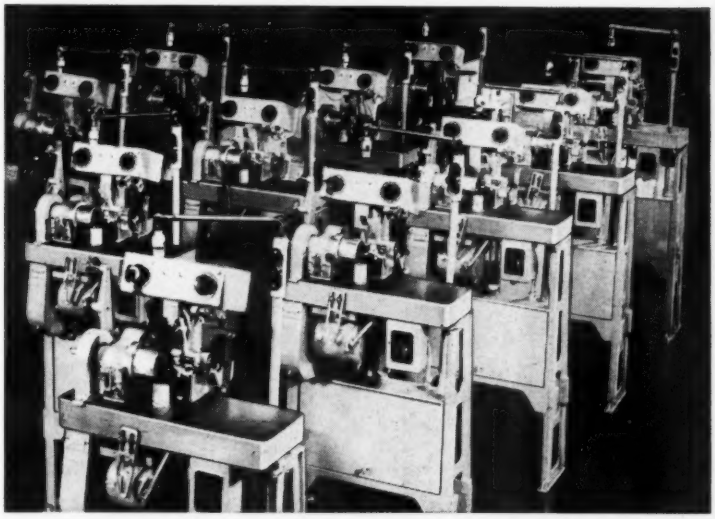

FIRST WINDING
990 COILS PER LINEAR INCH
6 times thinner than human hair!
SECOND WINDING
WINDS INITIALLY COILED WIRE INTO FINAL FILAMENT COIL
(GREATLY MAGNIFIED)

BARTH-BUILT FILAMENT WINDING MACHINES

HAVE TELESCOPIC SIGHTS TO SEE WHAT'S COOKING!

FIRST WINDING—operating at 9000 rpm, the machine coils an .0005" diameter tungsten wire (six times thinner than human hair) around an .0025" diameter steel wire core (also thinner than a human hair), at the rate of 990 turns to the linear inch . . . each coil is precision spaced at .0005" between coils . . . no coil touches another coil and the steel core wire is subsequently dissolved in an acid solution.

SECOND WINDING—winds initially coiled wire over mandrel into larger coil for final filament use.



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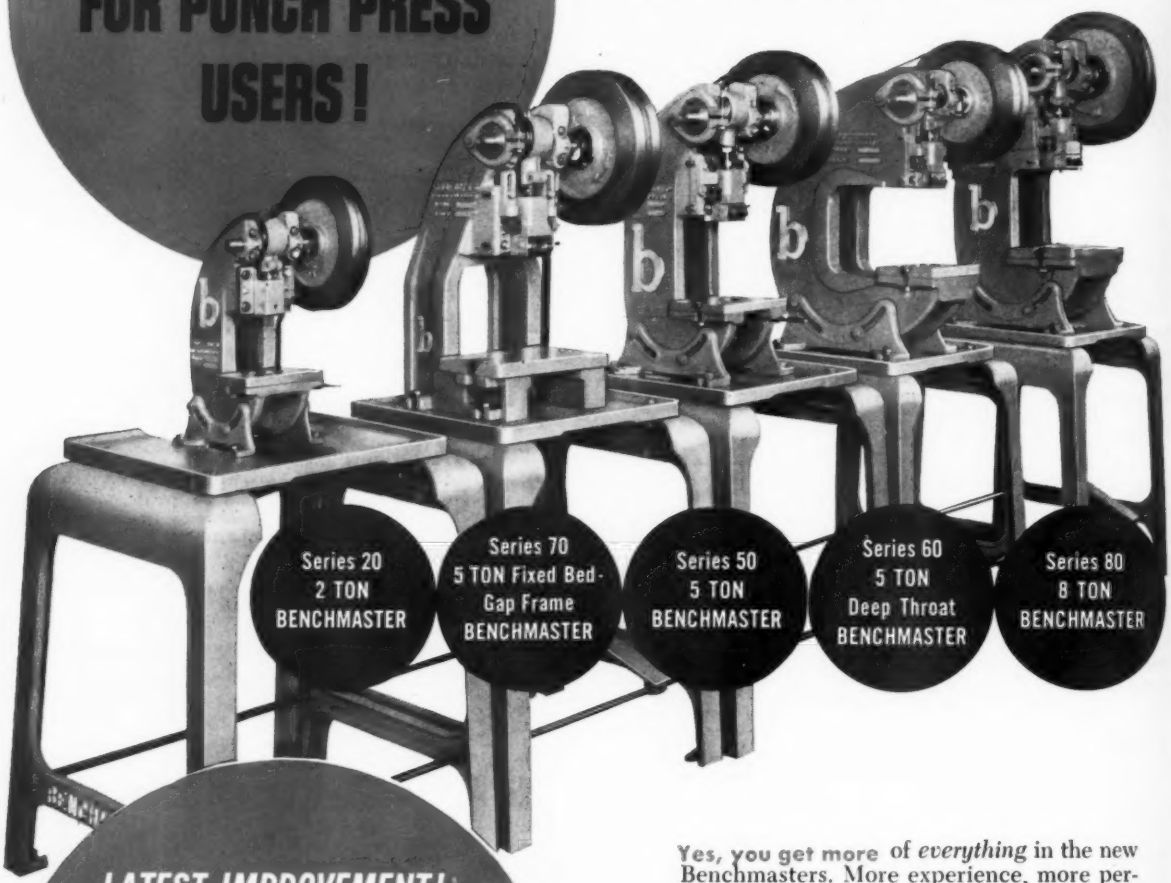
DIES • JIGS • FIXTURES • SPECIAL MACHINE • UNIT ASSEMBLIES • AUTOMATION • SERVO MECHANISMS • SPRINGS

CIRCLE INFORM-A-GRAM KEY NO. 41

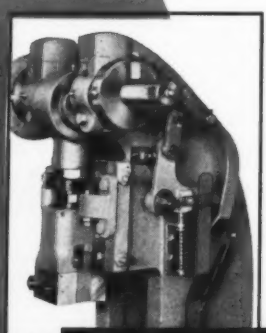
BIG NEWS! FOR PUNCH PRESS USERS!

A complete NEW Line of Low Cost benchmasters with INCREASED TONNAGE!



LATEST IMPROVEMENT!

Benchmaster is now equipped with this oversize *sliding key type clutch dog contained in a husky hardened steel collar*... takes load off the crankshaft keyway—insures trouble-free performance for years to come!



Yes, you get more of *everything* in the new Benchmasters. More experience, more performance, more satisfaction, more improvements, *and now a great new addition...MORE TONNAGE!*

Benchmaster's brand new line includes a whole new series of presses, partially illustrated here, available in both plain and back-geared types as well as half-presses.*

See these at your dealer's and compare prices. You'll see why Benchmaster has been America's favorite punch press for nearly two decades!

**2 Ton in Plain O.B.I. Type only*

1835 W. Rosecrans Avenue
Gardena, California

benchmaster

World's largest manufacturer of small punch presses and mills.

CIRCLE INFORM-A-GRAM KEY NO. 42

"Commendable Comments"

"Whether you conceive of automation as a wall upon which we can build a higher standard of living, a serpent that threatens our way of life, a tree that will protect us from storms of international conflict, or a rope by which civilization will hang itself, depends entirely upon your point of view. To my mind, the answer lies considerably to the right of center, but I cannot view automation as a panacea for all the world's ills, and least of all can I swallow the tumultous alarms of the prophets of doom . . . In G-E alone, we have 45-thousand people today who are making products that were unheard of 15 years ago. Their jobs exist only because we have employed the principles of mechanization and automation as a means of lowering consumer costs."

—From an address by Dr. W. R. G. Baker, Vice President and General Manager, Electronics Div. General Electric Company, at the Centennial Symposium, Michigan State College.

"If a single word is used to characterize America's economy, it is 'more'—the need for more *materials,* more *energy,* more *manpower, and* more *engineers . . . The materials problem is a pressing one, the energy problem is solvable, but the manpower problem can never be completely solved, it will always be the most vexing one."*

—From an address by Dr. Eric A. Walker, Dean of Engineering, Pennsylvania State University, at the Centennial Symposium, Michigan State College.

"The usefulness of technological developments and their application to human wants will depend, in a large part, on winning public understanding and acceptance . . . In lack of understanding we face a hazard that can retard the advance of technology . . . the only way to provide the margin of safety against this hazard is to sell ourselves and our product to our fellow men."

—From a talk given by Henry B. du Pont, Vice President Du Pont Company, to a group of visiting engineering professors.

"Qualified scientific manpower is our most important asset, there is a serious technical manpower shortage."

—Dr. Haldon A. Leedy, Director of Armour Research Foundation of Illinois Institute of Technology, before a chapter of American Institute of Chemists.

"Income per capita in this country in 1950 exceeded that of any other country and was probably 5 times the average for the world as a whole."

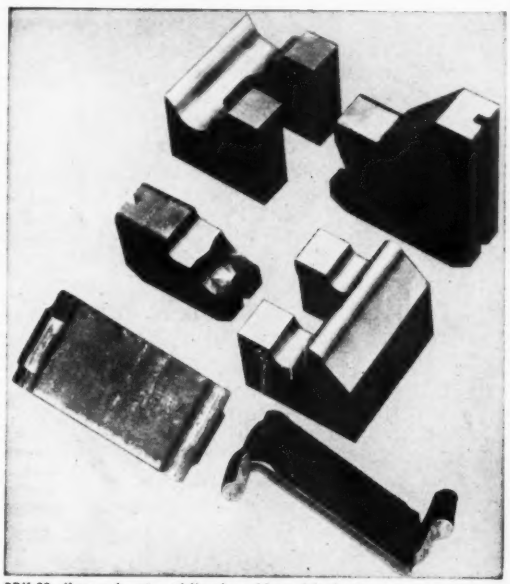
—Dr. J. Frederic Dewhurst, Twentieth Century Fund Report.

50% to...???

INCREASED PRODUCTION, PROVEN WITH . . .

Darwin PRK·33 TOOL STEEL

For the extra performance and savings you want from better wearing tools and dies—less downtime for retooling or regrinding and longer, more economical runs—it's not the first cost, but the "plus" of Darwin PRK-33 that counts. The unique composition of added Cobalt, Chromium, Nickel, Manganese and Molybdenum give PRK-33 both stainless and non-corrosive qualities—**plus, rigorous durability.** If you are now using standard 150 carbon, air hardening high chrome tool steel, it will pay you to call or write today about the savings you can effect with PRK-33!



PRK-33 dies and automobile door hinge blanks. Stock ⅜" thick, H. R 1020.

REPORTED BY PRK-33 USERS

HOT COINING DIES—Increased production from previous high of 7,000 pieces to 16,100 (130% increase) without sign of heat or wear cracks.

KNURLING TOOLS—Beats not only High Carbon — High Chrome but also High Speed Steels in many cases. One case reports 50% better than High Speed Steels.

DRAWING DIES — Philadelphia concern did over 60,000 pieces per grind, against previous best record of 16,000.

Complete line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Billet and Sand Casting, Drill Rod, Flat Ground Stock and Tool Bits. Bulletin on Request.

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CIRCLE INFORM-A-GRAM KEY NO. 43

MANUFACTURING MEMOS

Aid For Contract Shops . . .

● "An equitable competitive opportunity for the contract tool and die industry" is provided in the Defense Department's new directive on subcontracting policy, according to John Hamlin, small business advisor to the Department. It "urges" prime contractors receiving defense contracts in excess of $1 million to "establish and conduct a Defense Subcontracting Small Business Program" and contains instructions for the prime contractor who has subcontracting possibilities, including the designation of a company executive as a small business liaison officer.

Grinding Laboratory . . .

● Mattison Machine Works' new Grinding Methods Laboratory in Rockford, equipped with major types of modern grinders for machining flat surfaces, permits the study and demonstration of surface grinding equipment, techniques, and principles. Manufacturers are invited to submit parts for sample grinds and production estimates.

Congratulations . . .

● For his "significant technical contributions" toward the development of an anti-aircraft gun for shipboard use by the Navy and for guiding the tests of the completed gun, H. Ward Hahir, manager of engineering for the Naval Ordnance project at Westinghouse Electric's Sunnyvale (Calif.) plant, is the recipient of the company's highest honorary award — the Westinghouse Order of Merit.

● Chrysler Corporation's expenditures for plants and equipment, including special tooling, will amount to more than $120 million this year, George W. Troost, Chrysler vice president, told Security Analyists of Los Angeles recently. As a part of this program, the company's Mound Road plant in Detroit is being equipped and expanded for the production of 3,000 Plymouth V-8 engines a day.

● Five hundred employees of the Detroit Stamping Company and their families joined company executives recently in celebration of the company's 40th Anniversary.

Continental Coatings Corporation of Illinois, Chicago, has signed an exclusive license agreement with Armour Research Foundation of Illinois Institute of Technology to use the latter's patents in "Flame Spray Ceramics" in the service contract applicator field. The agreement gives Continental the right to sub-license other organizations. Reports indicate that coatings resulting from the new process are exceptionally effective because of their great resistance to heat and chemical stability.

◆

Stillman Rubber Company, Los Angeles and Cleveland, has qualified as an approved source of supply for AN 6290 O-Ring gaskets for use in Air Force aircraft, hydraulic, and pneumatic systems, according to Harry Franklin, general manager. The firm's compound SR 810B-90 met qualification requirements during tests at the USAF's Wright Air Development Center.

◆

The modern one-story research building now under construction will expand tool research activities of the Wesson Company's research and development departments. When completed, the building's shop will house a complete range of equipment for actual tool testing.

◆

Equipment and dies for the production of projectiles by Mullins Manufacturing's Koldflo cold extrusion process are being proved and production routines established at the Naval Industrial Reserve Ordnance Plant at Hays, Pittsburgh. Then it is anticipated that the plant will go into stand-by status.

◆

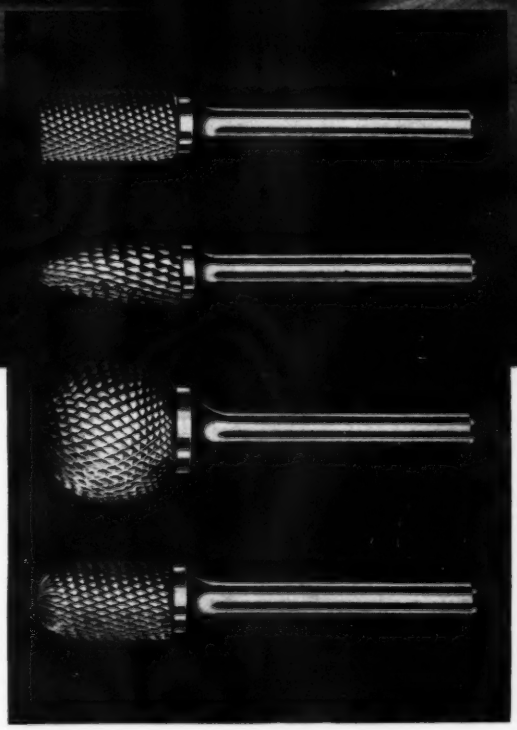
A multi-million dollar transformer and circuit breaker manufacturing expansion program is being undertaken by Allis-Chalmers Manufacturing Company at the A-C plants in Terre Haute, Ind., and Gadsden, Ala.

◆

The stock, machinery, designs, and development work of Lindberg Air and Hydraulic Division has been purchased from Lindberg Engineering by Teer, Wickwire & Company, Jackson, Mich. An unusual feature of the transaction is that Teer, Wickwire took over the entire field sales organization and immediately began marketing air and hydraulic cylinders under the Lindberg name.

KNOWN
by the company they keep

PRATT & WHITNEY
KELLERFLEX
CARBIDE BURS



Able to cruise around the world at comparatively high speeds without surfacing, the atomic-powered submarine, USS Nautilus, is a giant stride into the future by American science and industry.

Throughout construction of this most advanced of all underseas craft by Electric Boat Division of General Dynamics Corp., P&W Kellerflex Burs — representing the ultimate advances in bur technology — were used exclusively. And aboard the Nautilus — where each part is weighed to the ounce and only the most essential equipment is carried — it is also significant that P&W Kellerflex Burs are included in the tool kits.

Yes, wherever only the finest will do, you'll find Pratt & Whitney Kellerflex Carbide Burs. For complete information, write on your Company letterhead for Circular No. 564.

SEE THEM AT BOOTH 1219

THE MACHINE TOOL SHOW
CHICAGO, ILL.
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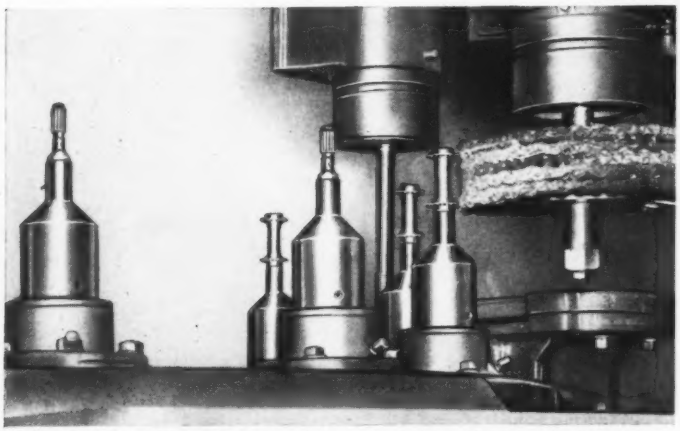
DIRECT FACTORY REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE COUNTRY

FIRST CHOICE FOR ACCURACY SINCE 1860

MACHINE TOOLS • CUTTING TOOLS • GAGES

Self-release, greater grip, automatic alignment of ERICKSON MANDRELS speed small to large part loading



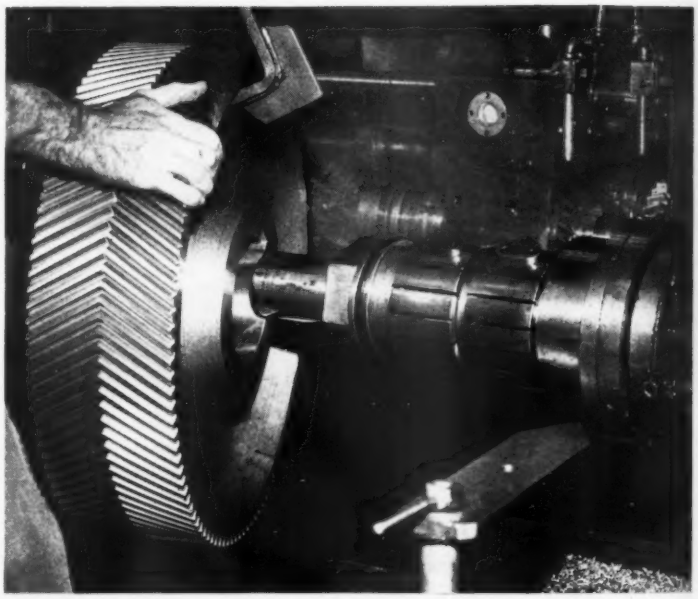
SMALL ERICKSON MANDRELS play a big part in holding down production costs for leading bicycle parts manufacturer. Here you can see how Erickson drawbar-operated, precision expanding mandrels speed wheel hub loading for buffing operation. Ease of operation and instantaneous release have greatly speeded this quantity production holding problem.

Regardless of size, Erickson precision expanding mandrels operate on Erickson's famous double-angle principle that not only assures guaranteed accuracy of .0005" T I R, but also makes mandrels self-releasing. They are available for air, hydraulic or manual operation. Special mandrel sleeves are designed to match various internal forms. AA-11

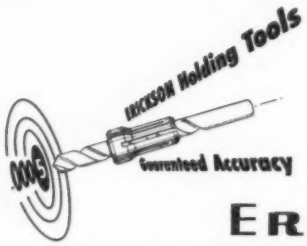
ERICKSON MANDREL ADVANTAGES

- Instantaneous self-release greatly speeds loading and unloading
- Greater holding power because grip extends over entire sleeve length . . . stops wobble and chatter
- Guaranteed accuracy of .0005" T I R
- Each sleeve covers a range of 1/32"
- Sleeves are interchangeable on mandrels of same series

Are you bothered by a tough internal holding problem? Then let us prove that Erickson mandrels speed production for lower unit costs. Give us a call today or write for catalog K.



ERICKSON MANDRELS speed large part handling, too. See how easily this heavy shovel gear, 24 inches in diameter, is being loaded for gear cutting at the Alten Foundry and Machine Works, Inc., Lancaster, Ohio. Larger shovel gears up to 61 inches in diameter are handled just as easily. At Alten Foundry, using an Erickson mandrel, loading and automatic alignment require only 10 percent of the time required by plants using solid arbors and arbor presses. Even this large mandrel is self-releasing. Operator fatigue is practically eliminated.



ERICKSON TOOL COMPANY

2301-7 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 46

are you budgeting your show time adequately?

One of the outstanding new machine tools that will be seen at the Chicago machine tool show in September is the spanking new model of one machine that has been a favorite in industry for many many years.

The productivity of the new model as compared to the old has been upped as much as 60%. At the same time its operation, control, and maintenance have been appreciably simplified. It has many features built-in which heretofore were extra-cost accessories.

So here is a new concept and design of a traditional machine which in quality capability, cost cutting potential, productivity per square foot of floor space, and earning power, stands head and shoulders above its honorable predecessor. In other words, it is worth more and consequently it should cost more. And does it? Yes — about 3% more!

Along with redesigning the machine, the manufacturer "redesigned" his production of it! New machine tools (from other machine tool builders), new tooling, new and special handling equipment and plant lay-out to reduce in-process time . . . all combined to provide a straightforward flow of production with minimum movement of work between operations.

Here's the pay-off: If it were not for the redesigned production — if the new machine were manufactured by the same facilities and methods as the old, we were informed that its selling price would have been upped about 46% instead of 3%!

This case has been recited simply as being truly representative of what is awaiting you at the machine tool and equipment shows next September 6th to 17th.

The above new machine will be there, and all of the contributing machines and types of tooling and equipment that made it possible will be there for your study and observation.

What is such a machine (and there will be many other equally sensational disclosures) worth to you in "looking time"? Two minutes — twelve minutes — half an hour?

That is the question, and that is the point of this editorial.

Recently we conducted a survey of those who are planning to attend the Chicago shows. The estimates of time to be spent at the exhibits were woefully on the low side, averaging a scant two days.

Between the three locations, there will be more than four hundred exhibits of cost-cutting, productivity-increasing machines and tools. There will be new, highly mechanized machines actuated by electronic controls which, although they represent the ultimate in simplification for the operator, will take you at least fifteen minutes to determine whether you want to get into their details!

There will be so many automatic operations of high repetitive accuracy performing before your eyes that it will take you longer than you'd believe just to overcome your skepticism.

And how about one "hole in the wall" booth that will be occupied by some seventy machine tools? Try to get out of there in less than an hour!

You are not going to be able to say, "All I want is a machine that will turn out this workpiece at a faster rate and lower cost; I don't care whether it's done with mirrors or marbles!" Neither your conscience, your intelligence nor your innate sense of curiosity can be satisfied by such an approach. Although "seeing is believing", you have to have a reasonable understanding of how a machine works in order to determine whether it is for you.

Remember, these are operating shows, the world's greatest production facility in action. And remember, too, that what you are looking for and at, your toughest competitor will be right there looking for and at.

You owe it to yourself, your company, and your customers to get out of these exhibits and demonstrations all that you can get. If you attempt the impossible by trying to do it in but two days, you will only be short-changing your own fund of know-how.

E. Willard Pennington

editor

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Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PUBLICATION PREVIEWS 86
Capsule description of current literature. Bulletins, brochures, catalogues and circulars — You name it.

PROGRESS ON PARADE 110
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

Appliance manufacturer forms flat stock to scroll shape.

DI-ACRO
HYDRA POWER **BENDER**

Simple and complex bends are being formed at low cost in daily production across the nation with hydraulically operated Di-Acro Benders. The Bender can be delivered completely tooled by the factory for bending tubing, moulding, extrusions and special materials. For a free production estimate, send a dimensional sketch and sample material for your component.

Send For Catalog "IT'S EASY TO BEND"

See 2 Di-Acro Exhibits at Chicago Sept. 6-16 Production Eng. Show, BOOTH 125-126, Navy Pier Metalworking Show, BOOTH 653, Chicago Coliseum

pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO., 315 8th Ave., Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 48

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ELECTRICAL DISCHARGE MACHINING. "Production Machining of Tools and Dies by Electrical Discharge" by Richard Stoke, Elox Corporation of Michigan 51

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QUALITY CONTROL. "Control of Quality in Finely Finished Surfaces" by B. H. Goehring, Norton Co....54

Measuring the depth of a scratch only one millionth of an inch deep on finished surfaces, is performed at the Norton Co. as an important part in controlling the quality of lapped surfaces.

INDUCTION HARDENING. "How About Hardening by Induction?" by Fred Spencer, Metallurgical Consultant 55

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AUTOMATIC LATHE. "9⅜" Second per Piece, 384 Pieces per Hour"..59

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FEED INDICATOR. "A Compact Feed Rate Indicator" by E. E. Opel, National Automatic Tool Co. 64

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MACHINABILITY COMPUTER. "Better Job Planning With Machinability Computer" 65

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• accuracy
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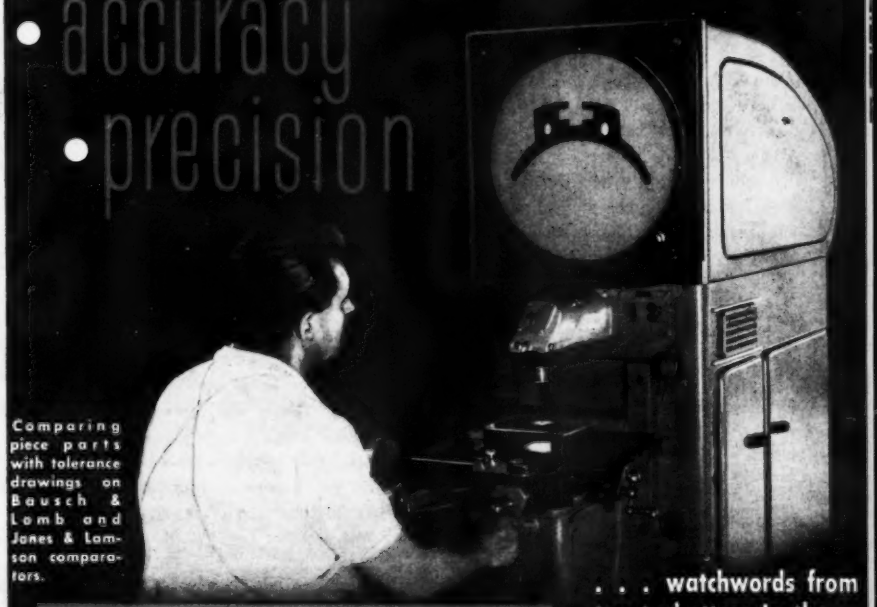

Comparing piece parts with tolerance drawings on Bausch & Lomb and Jones & Lamson comparators.

Another Harig Carbide die designed to out perform a comparable steel die ten to one.

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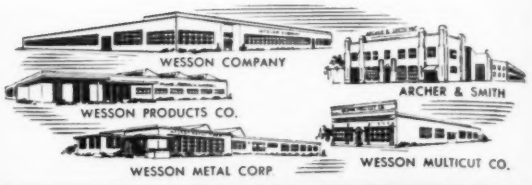
carbide NEWS



New Wessonmetal "26" Boosts Tool Life 40%

Optimum performance of "nearly universal" grade extends over range of 100 to 400 sfm

Gains in tool life ranging up to 40% over other steel cutting grades are reported for Wesson Metal Corporation's new Grade 26. The new steel cutting carbide has consistently outperformed all other steel cutting grades in 95% of all machining operations on which it has been applied.

Indications now are that the new Grade will produce significant increases in tool life over approximately 80% of the entire steel machining range. While created primarily to handle all types of steel rough and semi-finish machining—light, medium and heavy duty—it also is proving highly effective on some finishing operations.

What is more, the new Wessonmetal grade is not limited to a narrow range of cutting speeds. Optimum performance for Grade 26 extends over a range of 100 to about 400 sfm, covering 95% of steel machining operations encountered in industry today.

Since Grade 26 is the closest approach to a "universal" carbide for steel cutting yet produced, it reduces the number of grades required for steel cutting operations by as many as four grades. Problems of grade selection are greatly simplified, therefore, by the new Wessonmetal grade.

Much of Grade 26's outstanding performance is due to its superior cutting edge strength. Particularly important at the elevated temperatures generated at high cutting speeds, are the carbide's inherently high red hardness combined with high thermal conductivity.

Grade 26 is now in full production at Wesson Metal Corporation's new metals plant in Lexington, Ky.

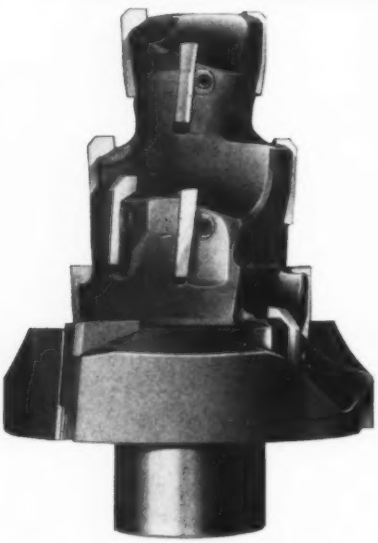
Tool life took a big jump on this severe interrupted cut on a forged steel tractor brake band anchor. Cutting speed ranges from 280 sfm down to zero. Feed is .027", depth of cut is ⅛".

Multi-Diameter Cutters Slash Tool and Machining Costs

Special eight-operation cutters designed by Wesson Company engineers permit a major builder of commercial air conditioning units to achieve a sizable reduction in the cost of machining compressors.

Solid Wessonmetal Grade GS blades are used on the cutters to produce 3600 cylinders per grind, compared with only 250 cylinders per grind previously. Grinding takes one-third as long as on tools previously used.

Although solid carbide blades are used on this operation, these special multi-diameter cutters are typical of the many other special Wesson designs incorporating standard blades which provide interchangeability of solid carbide, carbide tipped or HSS blades without modifying blade slots.



A total of eight chamfering, semifinishing, finish boring and facing operations are performed at each of five stations with these cutters on a W. F. & John Barnes boring machine.

tools Wesson carbide Wessonmetal

For answers to your machining problems write:

WESSON COMPANY, DEPT. AD, 1220 Woodward Heights Blvd., Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 50

The adaptation of a tool and cutter grinder to the electrical discharge machining process. The comparison tests reported in Tables I and II were run on this type of equipment.

PRODUCTION MACHINING OF TOOLS AND DIES BY ELECTRICAL DISCHARGE

ORIGINALLY, the process of machining by electrical discharge was confined to the salvage of production parts within which broken cutting tools were embedded. While Elox Corporation still conducts a large volume of tool salvage activity, several years of intensive research have brought forth technical advances to the extent that the process is applicable to a great variety of precision metalworking operations.

Drilling, grinding, tapping, boring and shaping the higher alloyed metals, metals of greater hardness and density, can now be done by electrical discharge machining within any desired tolerance. This opens entirely new avenues of approach to production, with no necessity to compromise on designs due to any machining limitation.

The flexibility of the Elox process has created new opportunities in developing more efficiency from present tools. Intricate die contours in hard metals present no problem. Contour shapes in carbide cutters are obtainable on a most economical basis. Dies formerly made in segments by conventional machining methods can now be produced in one piece in far less time at a fraction of prior costs. Wherever this process has been employed to meet both precision and production requirements, it has produced exceptional results in time and cost savings.

As an example of the savings effected in grinding carbides, the following report was made by one of the largest automotive manufacturing companies in the country.

An Elox-equipped Cincinnati No. 2 tool and cutter grinder was placed in one of the company's tool rooms to run comparative tests of the Elox finishes on carbide tools against production grinding of the same tools by conventional diamond grinding methods. All the tools were ground by automotive personnel, and tool life reports were conducted and logged daily by the quality control group of the company.

The first tools that were subjected to tests were: Carboloy, grade 999, diamond shaped tools with eight cutting edges. The conventional method of grinding these tools at the plant was with a diamond wheel grind. After grinding they were then hand lapped to give a smooth cutting edge. The finish ground and lapped tools were forwarded to tool inspection where, under a high power microscope,

by Richard Stoke
Technical Assistant to the President
ELOX CORPORATION OF MICHIGAN
Clawson, Michigan

A finished jet blade forging die. During processing, both the die and the brass electrode are immersed in the coolant retainer tank of the Elox M-500 electronic machine tool. For this type and size of die, electrical discharge machining time was 5 hrs, compared with 30 hrs, by conventional methods.

50% were rejected before reaching production. Of the potential of eight cutting edges, only four returned maximum tool life.

The explanation given is that in diamond wheel grinding, the diamond wheel bulldozes metal ahead of the wheel, hence the initial edge-making contact with the wheel leaves a well ground edge as the metal has been pushed away from it. However, the trailing edge where the wheel leaves the work is left feathered with an overhanging burr.

The Elox method of sharpening this same tool, using a Cincinnati No. 2 cutter grinder equipped for electrical discharge machining, employs a 12" x 1" x 1½" free machining yellow brass wheel. The tool was passed across the face of the wheel and a finish of approximately 9 micro-inches was obtained on the carbide tool. Inspection of tools was eliminated as it was found that the human variable in applying mechanical pressure to the grinding was no longer a factor. Elox equipment is completely automatic. There is no contact between tool and wheel so that the machine operator's skill has little bearing on the end results. Electrical discharge machining returned a guarantee of eight good cutting edges which delivered a 600% increase in tool life.

Results of two of these tests as made by the quality control group of the automotive company are shown in Tables I and II.

The second test was made on ½" solid carbide blanks. Tool grade was Kennametal, K6. The job was to diamond grind each end of the tool in a flat plane and then lap to insure a 12 micro-inch finish. With the Elox method, three passes were made across the end of the tool with a brass wheel. The results were a 9 micro-inch finish on the tool with no need of additional hand work. The comparisons made from the test are shown in Table II.

TABLE I

	Standard Grind	Elox Grind
Type of Abrasive	Diamond	12"x1"x1½" Brass Wheel
Type of Grind	Concave Both Ends	Flat Both Ends
Minutes per Grind	21.0	8.07
Pieces per Tool Edge	58	158
Cutting Edges per Tool	8	8
Total Pieces/Tool Grind	464	1264
Range of Wear Lands	.015—.020	.005—.007
Total Regrinds per Tool (est.)	24	67
Av. Production per Hour	40	40
No. Tools req'd per Month (est.)	4.7	1.15
Tool Cost per Month	$58.94	$14.42
Estimated Monthly Tool Savings		$44.52

4 Machines × 2 tools per machine × $44.52 per tool = total departmental savings per month: $356.48. Per year: $4,273.92

TABLE II

	Elox Grind	Abrasive Grind
Type of Wheel	12 x 1 x 1½" Brass Wheel	Diamond (on lap)
And Operations	One: 3 Passes: #1, #2, #4 Settings	Rough Finish and Lap
Type of Grind	Flat Both Ends	Flat Both Ends
Micro-Inch Finish	60	80-100
Land Wear	0.010"—0.020"	0.015"×0.030"
Grinding Time	10 minutes	20 minutes
Pieces/Grind Edge	982	491
Pieces/Tool (av.)	11,784	5,892
Cost per Grind	$ .60	$1.33

The conclusions made from the automotive company's quality control tests on these and numerous other jobs, indicated that electrical discharge grinding advantages over abrasive grinding were

Grinding Time:
38% of abrasive grinding time
Cost per Grind:
33% of abrasive grinding costs
Pieces per Edge:
300% more than from abrasive grinding
Pieces per Tool:
368% more than from abrasive grinding.

As a further example: With new designs and new alloys now being used in jet blades, the problem of forging die maintenance has become of prime importance. As an example, the trailing edge sections of the blades have been thinned down to as little as 0.004" and the dies wash out very quickly, often as far back as ⅛" from the trailing edge after forging as few as 200 blades.

Titanium alloys, due to their work-hardening properties, are very abrasive on die steels. These new alloys also present a problem of finish grinding the blades after they have been forged.

Tolerances have been tightened up on new designs. A former trailing edge thickness of ± 0.005" is now ± 0.001" in a new thin blade. This means that a die now made to the minimum size, can only wash out 0.002" before it is out of tolerance.

To resurface a die by the Elox process, the following procedure is followed:

When a new die is ready for production, it is put into the press and a number of brass electrodes are struck from the die. The number to be made is determined by (a) the number of blades to be made from the die, and (b) the anticipated number of parts to be forged before die washes out of tolerance.

These electrodes are made by several methods. If there is a deep extrusion to be made in the die, the brass is heated and hot forged to the desired shape but somewhat thicker than the finished blade would be. It is then cooled, annealed, and restruck in the die to cold-coin it to exact size. These electrodes are stored until such time as the die needs resurfacing.

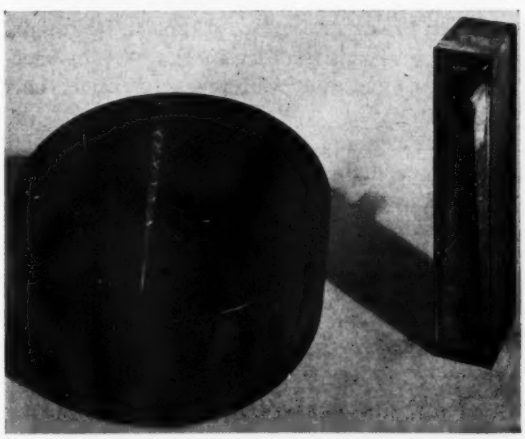
When it is necessary to resurface the die, it is placed on the bed plate of the Elox M-500. The electrode is attached to the spindle and aligned in the correct position in relationship to the one die. The depth to which the cavity must be sunk to refinish will determine the number of electrodes that must be used. For example, a die that has only to be sunk to a depth of 0.002" can be completely resurfaced with one electrode. The die that has to be refinished to a depth of 0.010" would take three electrodes. The shape, depth, and accuracy of the desired form will determine both the time and the number of electrodes needed.

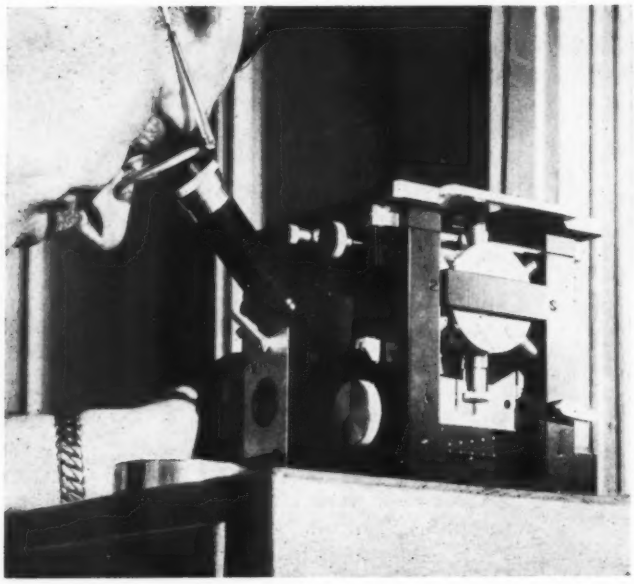
The die can be sized after wash-out in two hours time without need of annealing and hardening. It has been found that a greater die life results from the Elox finish due to the fact that the minute cavitation of the surface has a tendency to retain the graphite lubricant. This is especially true in impact forging dies. In resurfacing the die, and taking out as much as 0.015", we are still leaving a work-hardened surface as a wear land on the die. This and the elimination of heat-treating increases die life considerably.

Of equal importance in metalworking is the making of tools for broaching, shaving, centering, extruding, laminating, forming, heading, and drawing. A great many of these tools formerly made of hardened steel, now can be made of carbide, giving greater tool life, and at a cost hardly exceeding that of manufacturing them from steel.

Electrical discharge machines have been set up in numerous manufacturing plants throughout the country and are proving to be a practical approach to precision production. The process is not a substitute for conventional machining but a brand new application of machining, and provides performance not possible by traditional methods. It means substantial savings in time, material, and labor where it can be applied.

A washed-out jet blade forging die which can be re-machined by the Elox process and restored to service in 2 hrs. Normally the die would be out of service for 72 hrs due to the need for annealing, resizing, and hardening.





Work to be inspected is placed on the top of this Zeiss Interference Microscope to check surface finish. A camera can be attached at the opening below the eyepiece to take photomicrographs. The turret head gives a selection of three magnifications. Mirrors which cause the interference bands are mounted on the turret opposite the corresponding lens.

by B. H. Goehring
Product Quality Engineer
Grinding Machine Division
NORTON COMPANY
Worcester, Massachusetts

Control of Quality in FINELY FINISHED SURFACES

THE EVER INCREASING DEMANDS for more finely finished surfaces posed a double problem for Norton Company, builders of precision grinding and lapping machinery. In addition to the refinements of engineering required to build the machines, there was the added problem of evaluating the resultant surface finish.

A Zeiss Interference Microscope, capable of measuring the depth of a scratch only one millionth of an inch deep, is now playing an important part in controlling the quality of lapped surfaces. This microscope, believed to be one of only three or four such instruments in the United States, is being used by Norton Company to study surface finish and the effects on finish of various finishing methods. It is the most satisfactory method for inspecting the finish and roundness of small ball bearings.

The instrument, as its name implies, is an optical measuring device. It can be used as a conventional microscope. When the surface is lighted by a Thalium light (light of a single wave length), interference bands appear across the surfaces on the work. The distance between the bands is eleven millionths of an inch. Surface imperfections, such as a scratch, cause deflections in the bands. The deflection corresponds to the depth of the scratch and can easily be estimated in comparison with the width of the band. Accurate measurements are easily taken from photomicrographs made with the camera attachment that is specially built for the microscope.

The bands seen in the eyepiece are similar to those seen when using optical flats. The

. . . *Continued on page 82*

Surface finish of parts which cannot be placed on the microscope can be checked by "lifting a fingerprint". A special lacquer is spread on the surface to be checked. After it has hardened, the film can be peeled off and inspected.

How About

HARDENING BY INDUCTION?

by Fred Spencer
Metallurgical Consultant

CONSIDERABLE MATERIAL has been written on the theoretical aspects of induction heating, but the greatest interest lies in this method of hardening as a practical metalworking tool. Theoretical considerations would involve a discussion of the phenomena of hysteresis and eddy currents. From a practical standpoint, however, the only requirement that a metal must have in order to respond to induction heating is that it be an electrical conductor.

An induction heating circuit is fundamentally a transformer where an inductor, carrying an alternating current, is the primary, while the material to be heated serves as the secondary. In a hardening operation, the material to be heated is placed within the confines of a loop formed by the inductor. Upon a flow of alternating current through the inductor loop, the resultant magnetic lines of force will penetrate the surface of the material being heated and induce a flow of electrical energy therein.

The material (secondary) carrying the induced current is a conductor so it also has electrical resistance. Thus, induction heating may be compared to ordinary resistance heating in that heat is generated as a result of I^2R losses. Figure 1 shows a schematic arrangement of a typical inductor block (the primary) and a bearing area to be hardened on a cylindrical part (the secondary). In this setup, the inductor block has orifices through which the heated surface of the part to be hardened can be pressure quenched.

Equipment Requirements

Induction heating equipment consists of an inductor, suitable transformers and capacitors, metering devices, automatic timing controls, a source of high frequency power and, when employed as a hardening unit, suitable quenching auxiliaries. In many instances, the complete facilities, with the exception of the inductors, are contained in a cabinet, as exemplified by the two-station motor generator set illustrated in Figure 2.

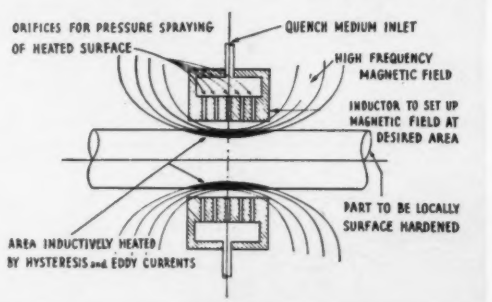
The various equipment types which are most frequently used in induction hardening employ for high frequency power generation (a) the motor generator; (b) the spark gap converter, either the mercury-hydrogen or quenched; or, (c) the vacuum tube converter. Each power type has its own range of application; the determination involves such factors as type of operation, the expected metallurgical results, the size of the parts, the power requirements, and the cost.

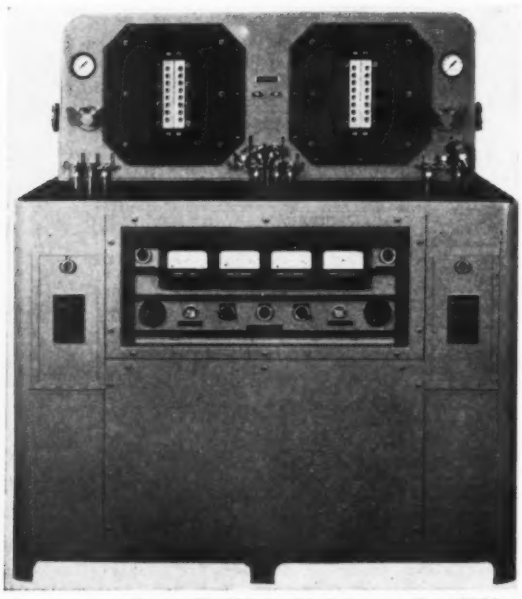
The motor generator set, as used for various heating applications, delivers standardized frequencies of 1,000, 3,000 and 10,000 cycles, in capacities from approximately 7½ to several thousand kilowatts. In this type of equipment, several heating stations may be operated from one central generator, with no limitations as to distance between the power source and remote heating stations. In addition, where larger blocks of power are required, units can be paralleled.

The spark gap converter generates higher frequencies than those normally available from motor generator sets. One type, the mercury-hydrogen gap, usually operates at

Fig. 1. Schematic arrangement of typical inductor block with "built-in" quench for hardening the bearing area of a shaft.

Courtesy The Ohio Crankshaft Company, Tocco Division.


ORIFICES FOR PRESSURE SPRAYING OF HEATED SURFACE
QUENCH MEDIUM INLET
HIGH FREQUENCY MAGNETIC FIELD
INDUCTOR TO SET UP MAGNETIC FIELD AT DESIRED AREA
PART TO BE LOCALLY SURFACE HARDENED
AREA INDUCTIVELY HEATED BY HYSTERESIS and EDDY CURRENTS



Courtesy The Ohio Crankshaft Company, Tocco Division.

Fig. 2. Typical induction heating machine for hardening applications. This equipment is provided with two work stations.

20 to 80 kc, with power ratings from 3 to 40 kw. In its application to the hardening operation, spark gap equipment is employed for average depths of case hardening in workpieces that are up to 1″ in diameter, and for the through-hardening of sheet, thin walled tubes, and sections up to ½″. The quenched gap converter operates at 100 to 500 kc with power ratings from 2 to 30 kw. Due to its power limitations, the equipment is restricted to the heating of small parts.

The vacuum tube converter generates the highest frequencies obtainable from existing designs of commercial induction heaters, i.e., 150 to 540 kc. The power rating of vacuum tube equipment is usually between 20 and 50 kw. The selection of specific equipment will be dependent upon section size, hardness depth, etc.; the information as given in Table I serving adequately as a guide.

The inductors are of necessity of accurate design, formed to dimensions in accordance with both the size and shape of the part to be heated. In a shop where induction hardening is a standard practice, inductor coils may be made as required. One of the more important design considerations is the spacing between the inductor and the workpiece. As the coil is placed farther from the work, the generated heat encompasses a larger surface area. As a result, a longer time is required to obtain the desired results. This slow, penetrating heat may be acceptable in such an operation as soldering; but, in induction hardening, the coil should be close to the work so as to obtain rapid heating.

The inductors can be either single or multiple turns of copper tubing thus permitting the use of cooling water. The tubing, which may be from ⅛″ to ¼″ in diameter, may be round, oval or square. Supports made of thin asbestos board or laminated plastic materials can be used to prevent the sagging of large diameter coils, and for spacing between multiple turns. Unsymmetrical objects are heated with round, symmetrical inductors due to the natural tendency of the induced current to follow the contour of the section being heated; this being illustrated in Figure 3 which clearly shows the heat treated portion of a sprocket.

Inductors may also be made from solid copper bars or forgings. The advantage of this inductor construction is that it maintains its shape more readily and insures reproducibility of results on critical hardening jobs. Figure

TABLE I

POWER SELECTION CHART FOR HARDENING BY INDUCTION

A—1st Choice. B—2nd Choice. C—3rd Choice.

	Motor Generators 10—1200 KW (up)			Spark Gap Converter		Vacuum Tube Converter
				Mercury Hydrogen	Quenched	
	1000 cycles	3000 cycles	10000 cycles	3-40 KW 20-80 KC	2-30 KW 100-500KC	5-200 KW (up) 150-540 KC
Very Thin Case; 30 to 40 mils	—	—	—	—	—	A
Average Case; 30 to 60 mils						
(a) Up to 1″, diam.	—	C	A	A	A	A
(b) 1″ to 2″, diam.	—	B	A	C	B	B
(c) 2″ and over, diam.	B	A	A	—	—	C
Deep Case; over 60 mils						
(a) 2″ to 4″, diam.	A	A	B	B	B	B
(b) 4″ and over, diam.	A	B	C	—	—	—
Through-Hardening						
Sheet, thin walled tubes	—	—	B	A	A	A
Up to ½″, diam.	—	—	B	A	A	A
½″ to 2″, diam.	—	A	A	B	B	B
2″ and over, diam.	A	A	B	—	—	—

*Ratings for hardening obtained from Ajax Electrothermic Corp., Trenton, N. J.

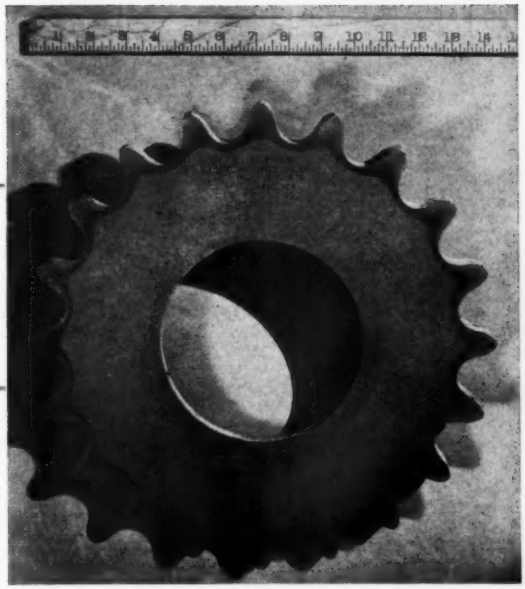


Fig. 3. An application of induction hardening to sprocket teeth. Etching reveals pattern and depth of hardened area.

Courtesy The Ohio Crankshaft Company, Tocco Division.

4 shows a wide variety of inductor coil designs; each being individually developed to suit a specific application. In the event that quenching is required directly after heating, the quenching mechanism can be an integral part of an inductor. Figure 5 shows a split type inductor block used for the hardening of crankshaft bearings. Note that the inductor block has holes on the inside so as to obtain a pressure spray quench after the workpiece has been brought up to heat. During the heating and quenching cycle the two halves of the inductor block are clamped together, silver contacts insuring perfect electrical contact.

Of equal importance is the design of heating stations to facilitate a minimum of work handling. This also includes fixtures designed for the handling of parts either manually or automatically; intermittently or continuously. Timing of the cycle of automatic equipment will greatly increase the efficiency of the entire production operation; these timers controlling one or more of the following: (a) rapid heating power 'on' and 'off' to accurately timed intervals; (b) feeding and/or ejection mechanism; and, (c) speed of intermittent motion of a conveyer.

Applications of Induction Hardening

Induction heating has become a standard method in the hardening of steel components. It involves good design of inductor block, proper choice of induction equipment, and, good engineering of safe and satisfactory quenching. The quenching medium usually employed is water; as either (a) a spray between the turns of an inductor coil; (b) a nozzle quench from one or more nozzles and directed onto the part that has been heated; and, (c) the conventional tank quench in which the parts are dropped by gravity after they have been induction heated.

One of the primary considerations is that of "depth hardness". This involves the met-

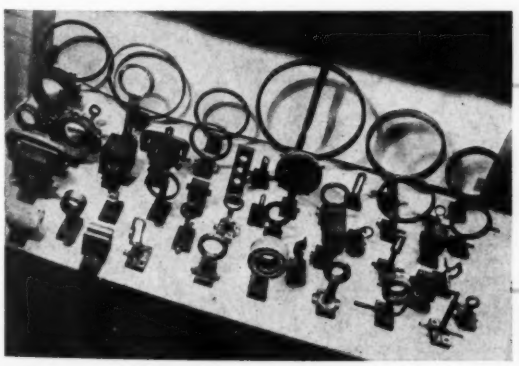


Fig. 4. A group of typical inductors of a variety of shapes and sizes. Each is designed to handle a specific application.

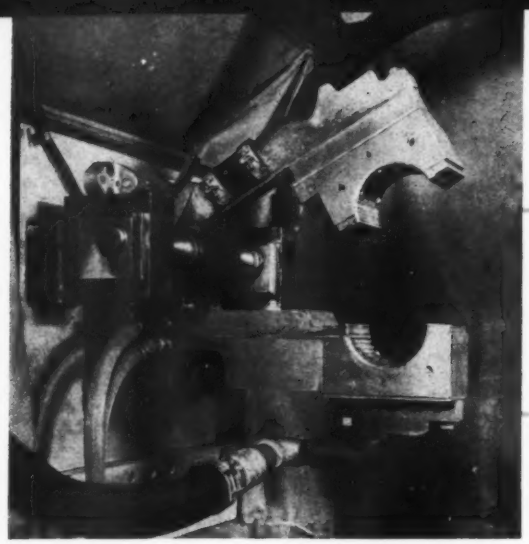


Fig. 5. This split or separable type of inductor block is for hardening crankshaft bearing surfaces. Note the openings in the blocks for flow of quenching fluid.

Courtesy The Ohio Crankshaft Company, Tocco Division.

allurgical response of the material to be hardened, as well as such factors as the frequency producing the inducted current; the design of the inductor; the size and shape of the part; and, both the magnetic permeability and electrical resistivity of the workpiece material.

In hardening, a period known as "solution" or "austenitization" must precede actual quenching so as to effect transformation to a hard, martensitic structure. This austenitization is especially important in the production of shallow hardened zones; and, in many instances, it is necessary not only to judicially choose the material composition, but also, to select a prior structure which will have a more rapid austenitization upon the application of heat. Thus, as to composition, materials such as SAE 1050 or a low alloy steel containing ferrite forming elements are satisfactory. Conversely, in the production of a shallow case, alloy steels containing carbide forming elements, as exemplified by chromium, molybdenum, tungsten or vanadium, should not be selected since these alloys will respond with difficulty to the rapid heating cycles of induction heating. As to prior structure, a mild carbon steel (SAE 1050) having a sorbitic structure prior to hardening will austenitize faster than a furnace-cooled sample of the same material containing massive free ferrite.

The importance of austenitization decreases as the allowable depth of hardness is increased, thus indicating that the above mentioned factors of prior structure and composition choice become of less importance. As indicated in Table I, a definite correlation exists between equipment choice and both the depth of hardness and the diameter of the bar to be hardened.

A common application of induction heating is for the hardening of crankshafts. Special vertical machines, Figure 6, are used in which three or four bearing surfaces are hardened in one automatically controlled operation. Several such units, each set for a different group of bearings, can be operated by one man to yield a continuous output. The bearing surfaces are hardened to a Rockwell C60 up to the fillet, leaving the core tough and ductile. Figure 7 shows unloading of a finished shaft.

Due to the flexibility of induction heating units, a multiplicity of parts can be hardened by the same equipment. This necessitates only changing the inductor coil and fixturing. Figure 8 shows the variety of parts hardened in

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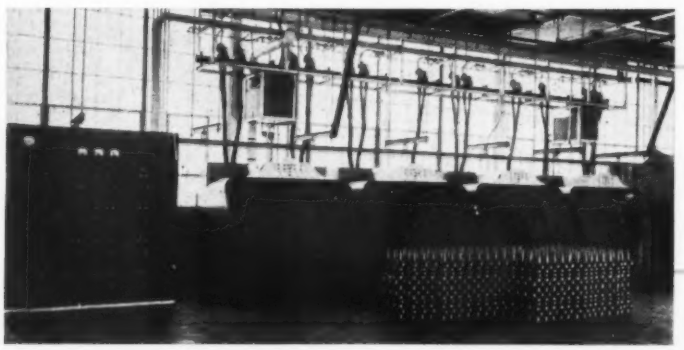
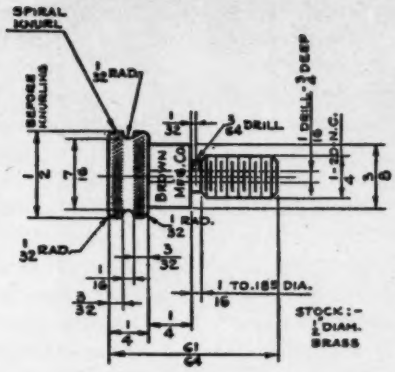


Fig. 6. A four-station setup for high production hardening of crankshafts.

Courtesy The Ohio Crankshaft Company, Tocco Division.

9⅜ Seconds per Piece



384 Pieces per Hour

WHEN BROWN & SHARPE engineers were given the green light by management to work out their concept of the better, faster automatic of the future, there were no strings attached to the proposition.

The only instruction was, "You may develop and improve but must not lose the setup convenience, the accurate cutting ability, or the aluminum-to-stainless versatility of the current machine." Starting with this admonition and a clean sheet of paper, they have come up with the machine illustrated here which is new from the floor up.

The performance and many features of the new No. 00 can be gleaned from its production of the workpiece shown in the title block.

The piece is produced from ½" diameter free machining brass rod and the machine's top spindle speed of 7200 rpm permits machining at 950 sfpm for the forming operation.

The constancy of this high speed is assured by a fine pitch chain drive to the ball bearing spindle.

To attain satisfactory speeds for threading, the No. 00 offers a selection of 14 ratios of low speed for every one of its 16 high speeds, or over 200 two-speed combinations. For the ¼"-20 threading of this piece a machining-threading ratio of 2.2 to 1 is used because of the free machining characteristic of the material.

The machine's design allows for maximum efficient turning and drilling distances. Turning the ¼"-20 thread diameter and drilling the ¾" deep hole are done with standard equipment. Both operations are completed with a minimum amount of idle time and with the backshaft running at a top speed of 240 rpm.

Workpiece accuracy is assured by a spindle mounted on preloaded ball bearings combined with the highly accurate alignment of the hardened and ground cross slides and turret slide. Thus, the workpieces can be finish turned to limits of 0.0005" with a single pass of a conventional roller-back box type turning tool.

Fig. 1. Brown & Sharpe's new No. 00 Automatic Screw Machine has a maximum spindle speed of 7200 rpm, takes stock up to ½" dia., for 1" of turning length (up to 1½" with special equipment), and includes a vertical slide as standard equipment, permitting an additional tool position. Centralized push-button controls include a driveshaft "jog" button which is particularly useful when setting up.

Forming limits (from stock size to finish) with one tool mounted on the cross slide are held to 0.0005" employing normal feeds. Heretofore, such forming and turning limits were only practical when auxiliary finishing tools were brought into use, such as rough forming from one cross slide and finish shaving from another slide. Thus, the new No. 00's capability of the finishing parts to limits of 0.0005" results also in reduced setup time, decreased tool holder inventory, and simplified cam design.

The workpiece in question requires the use of a vertical slide, as the front cross slide is occupied for a forming operation while the rear cross slide is occupied with a cross drilling attachment for completing the 3/64" hole. The vertical slide (a third slide) is a standard feature on the machine; there being a multiplicity of screw machine pieces where the use of the vertical slide is advantageous and, in many cases, absolutely necessary.

This particular part necessitates the drilling of a 1/16" hole, ¾" deep, a specification that has always presented problems; packed chips and lack of cutting oil at the drill point resulting in rapid dulling and periodic breaking of the tool. For this job, a new "skip indexing attachment" greatly minimizes the time required to drill small deep holes. In addition, it allows for complete withdrawal of the drill to clear chips and to cool and lubricate the cutting tip. By setting dogs at proper intervals on the dog carrier, the drill is withdrawn at the proper time without consuming a large portion of the cam surface. This attachment is even more important in drilling small deep holes in steel and, here again, savings in drilling time of 66% can often be realized.

The 3/64" hole, at 90° to the 1/16" hole, is drilled during the one handling of the piece by a motor driven cross drilling attachment which is mounted on the back cross slide and which has a four-selection gear reduction unit as standard equipment. For this free machining workpiece a 1 to 1 ratio is used. In order to stop the spindle during this cross drilling operation, a "brake in neutral" attachment is employed. This allows the use of both high and low speeds for any given job, and a third or neutral position is obtainable for a braking position. Other applications of the braking attachment would be milling from the back cross slide or the turret slide, also drilling and reaming offset holes from a turret position.

As the new Brown & Sharpe No. 00 produces this workpiece at a rate of 384 per hour, the operator finds that the operation of clearing chips from the machine has been greatly simplified. The opening in the bed, the chip bottleneck, has been doubled in area. The right front corner of the machine is exposed and a steel chip pan is located between the bed and the base. The chip pan can be removed by the operator as a unit, the chips disposed of and the entire unit replaced in a matter of seconds.

All of the features of the new No. 00 contribute to cutting cost of producing parts and allow an operator more time to devote to the quality of the work and to the setting up and attending of other machines. This spells increased productivity per man and per machine.

Fig. 2. The turret slide can be adjusted forward by ¼" or backward by ½". This adjustment can be used to get a convenient mean position for all turret tools or an exact position for one tool. It also permits easy accommodation of old sets of cams (5" diameter). New lead cam is 5½" diameter to give increased turning capacity.

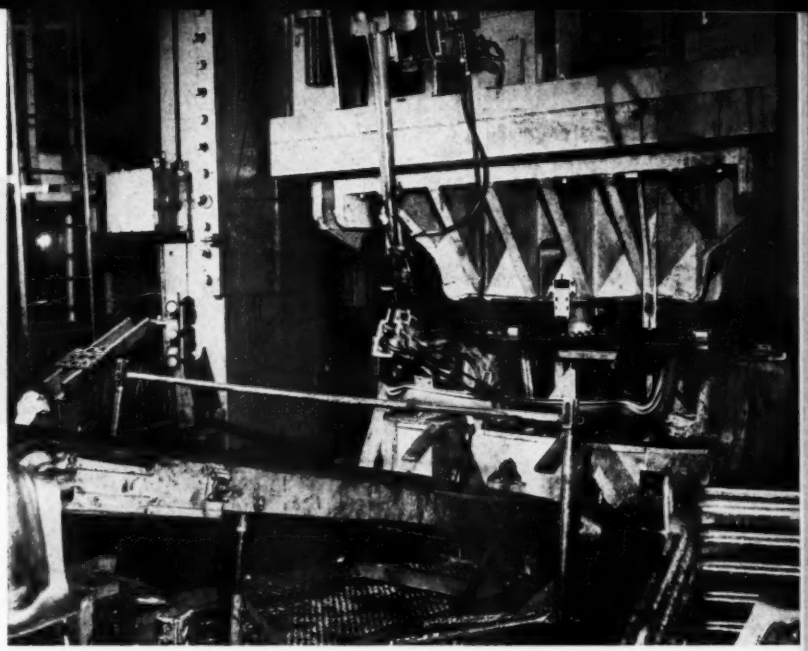


Fig. 1. "Iron hand" removing from the first press die a formed bumper that is transferred onto the inclined belt. In being advanced by the belt, the bumper is automatically turned over onto rails, advancing thereafter with outer face up, so that scratching is minimized.

PARTIAL AUTOMATION of Bumper Line SPEEDS PRODUCTION

by Herbert Chase, M. E.
Forest Hills, New York

PRODUCTION OF BUMPERS is now centralized by the Oldsmobile Division, General Motors Corp., in a new Lansing plant that is specially equipped for fast and partly automated manufacture of bumpers. One objective of the new setup is to minimize polishing and buffing, the cost of which is usually a considerable proportion of over-all costs.

This is accomplished in part, first, by roller levelling and flat polishing of selected strip steel of high grade initial finish, and, secondly, by applying a Bonderize and draw coat that helps to avoid scratching in forming and handling operations. Transfer arrangements between presses and care in handling also help to avoid scratches such as would require extra hand disc polishing.

After blanks are selected and roller levelled, they are passed through continuous rough and finish automatic polishing machines using abrasive belts that must yield an average surface smoothness of not more than 10 RMS micro-inches. This is checked by inspection, and blanks not up to specification are returned for repeat operations. The finish obtained is suitable for bright copper plating and requires hand polishing only where the subsequent press and handling operations produce scratches that cannot be avoided.

After flat polishing, the blanks are Bonderized and are given a draw coat that helps to minimize die and other scratches. All of these operations take place on the same continuously moving conveyor. Blanks thus treated are then delivered to the press line. There, blanks are loaded on a ball rack and are transferred by a swing arm, one at a time, into a loading carriage that advances the blank into the first forming die without the usual sliding across die surfaces.

Use of automation techniques, where required, and other process improvements have speeded up the production of Oldsmobile bumpers while contributing to reduction in hand polishing costs and improved product quality.

Fig. 2. Polished and Bonderized blank and Oldsmobile bumper bars as they appear after forming, trimming, piercing, and other successive press operations. These operations, as well as handling between them, are so done as to minimize scratches on front surfaces.

After forming, the workpiece is picked up by a Sahlin mechanical arm that removes it from the die and deposits it on an inclined belt, Figure 1. The piece as produced by this first forming operation is shown directly above the blank in Figure 2.

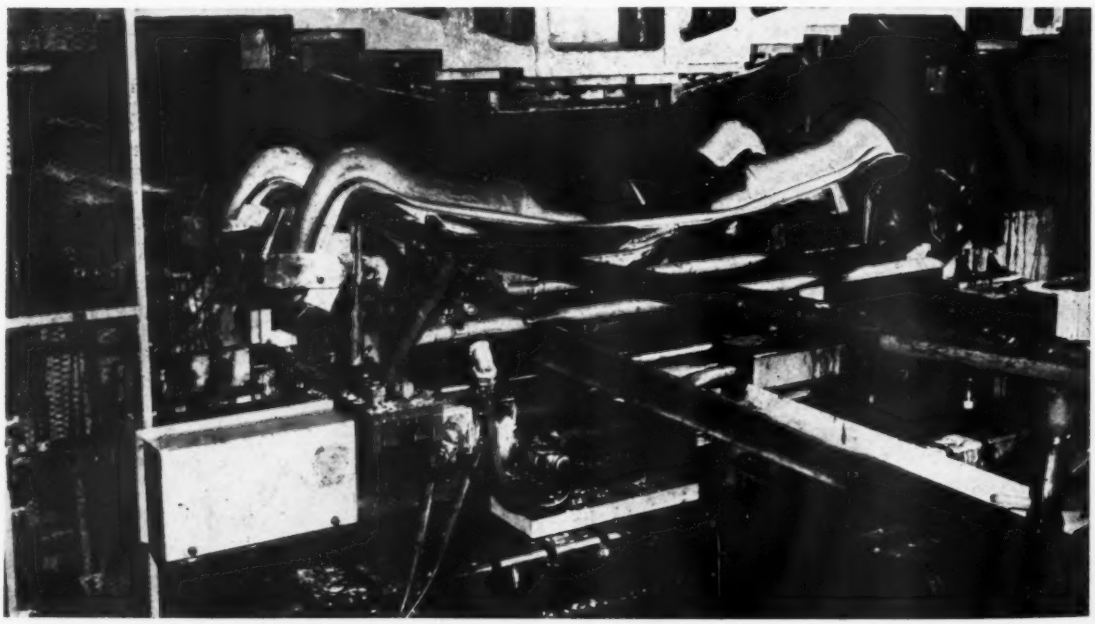
While being advanced by the belt to the second press, the piece strikes a turnover and continues on the belt and along slide bars where advance is by hand. In this and in advance to subsequent presses, that surface of the workpiece contacting slide bars is the inner one which, not being exposed in service, is not critical in respect to scratching.

Trimming of the bumper bar is done in the next press, Figure 3, equipped, as are most presses in the line, with a loading carriage. The empty carriage is positioned well in front of the die where it can be loaded easily and safely, without any sliding such as would produce scratches. The loaded carriage advances into the press and deposits the bumper in the die. After the die opens, the carriage removes the piece. Thus, the only scratches on the workpiece are those that result from contacts as dies close, these being not completely avoidable.

In the trim die, the bar is straightened as well as partly trimmed and then appears as in the second position above the blank in Figure 2. Portions trimmed off drop into chutes or onto belts for removal to scrap boxes.

Slide rails transfer the trimmed part to the third press, Figure 4, where the bumper bar is

Fig. 3. Second press setup in which flash is trimmed from much of the bumper contour. Loading and unloading of the die are done by a powered carriage that is moved horizontally while the die is open.



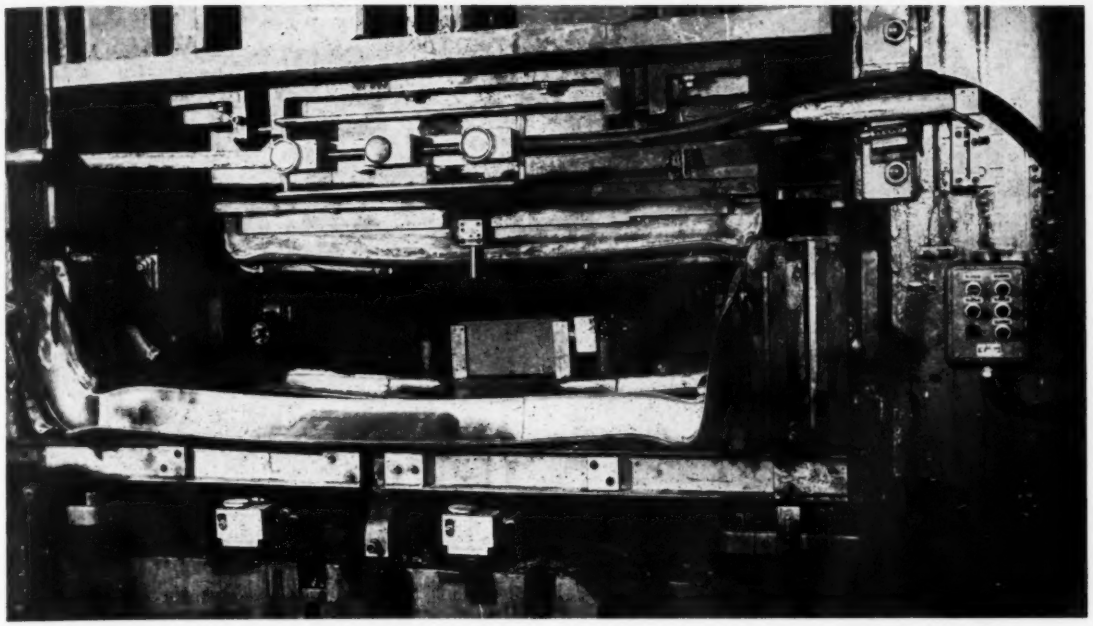


Fig. 4. In this press, the partly trimmed bumper is restruck in a die that gives the piece substantially its final shape. Loading and unloading are facilitated by a carriage that is moved in and out as required.

restruck to produce substantially its final shape. There is a similar transfer to two other presses of which one appears in Figure 5. Three dies mounted in each of these presses are used, with parts placed by hand in sloping position, to trim excess metal from right and left end portions and to form flanges that could not be produced in earlier operations.

There are additional flanging and piercing operations. But details of these are of minor importance except that, in one piercing operation, the slug is sheared but not pushed out of the hole because certain plating operations are simplified with the slug in place. Accordingly, it is not knocked out until after plating is completed.

Front or rear bumpers can be produced in the same presses, but with die changes made necessary by differences in shape. The above details apply largely to rear bumpers, but those on front bumpers are similar in most respects. Although the press line is far from being completely automated, the equipment for work transfer and for loading and unloading dies has appreciably increased manufacturing capacity and efficiency. Some of the economies achieved are a result of precautions taken to minimize scratching. Wherever scratches are avoided at points where their removal would require hand disc grinding, the labor for such grinding is saved. Some hand work is still required but is very limited.

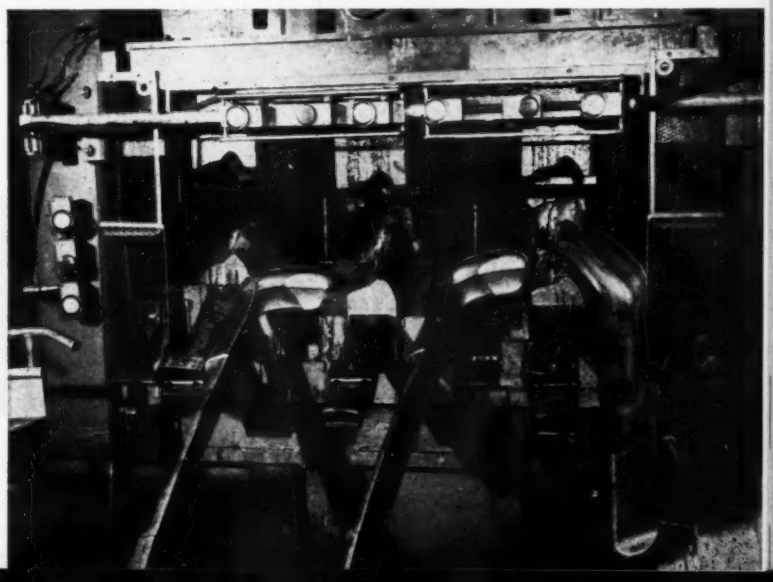


Fig. 5. Setup of three dies in one of two presses that trim and then flange end portions while the workpieces are in inclined position. Three pieces are shown resting against the press following press action.

Fig. 1. The pickup, with its magnet base, fits handily into the top of the meter case. The only external lead connects meter to pickup.

A Compact Feed Rate Indicator*

by E. E. Opel
Chief Electrical Engineer

NATIONAL AUTOMATIC TOOL COMPANY
Richmond, Indiana

FOR AT LEAST twenty years, the accepted way to measure linear feed rates has been to use a six inch steel scale and a stop watch. This has never been satisfactory. It requires a number of checks, takes too long, and involves some calculations. It would be much better to use some sort of instrument that would read "inches-per-minute" directly.

Our first try at getting an instrument that would do the job was to use an accurate tachometer. We used a push rod with a rack and gear to change linear motion to rotary motion. Then we used a gear train to multiply the RPM and tried to read "inches-per-minute" on the instrument scale. It was not satisfactory. It was too bulky and too hard to operate and neither sensitive nor accurate.

Despite the fact that we had to work with weak signals, we decided to use a slide wire pickup with filtering and amplifier circuits. We built up a rather bulky instrument to try out the principle. It worked well. We are still using it on our assembly floor. Its drawback is its size.

The next step was to design and build a smaller instrument which could easily be carried about.

The instrument is housed in a box 6″ x 7″ x 9″, Figure 1. It is entirely self-contained. To eliminate the power cord, which is always a nuisance on portable instruments, we decided to use batteries. The top serves as a carrying case for the pickup unit. This top cover can be removed when the instrument is used.

The pickup unit is connected to the instrument with a plug-in cable. The pickup unit has a permanent magnet on the bottom. This will hold the pickup unit to the base while a reading is being taken.

The instrument has a selector switch for selecting two feed rates, and for selecting the calibration setup. Two calibrating knobs are provided for calibrating the instrument. We do not expect any great variation, but if there is drift, the instrument can be recalibrated.

The setup for reading the traverse rate is very simple. The pickup unit can be used to measure either push or pull traverse. In each case the instrument reads the "inches-per-minute" traverse.

If it is desired to read pull traverse the procedure is to push in the pickup rod as far as it will go, and place pickup unit on the slideway

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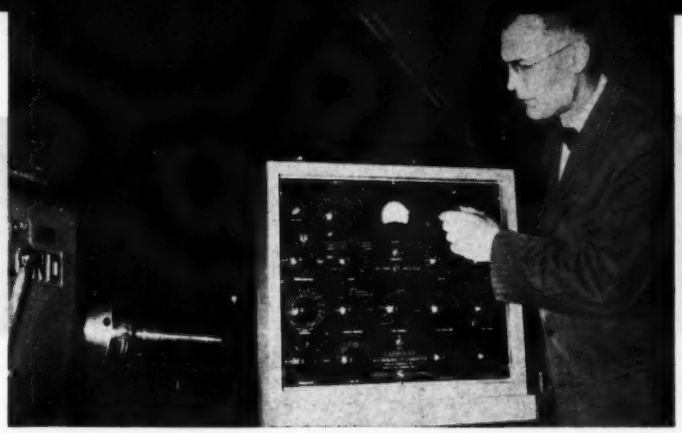
*Presented at the 19th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation.



Better Job Planning with Machinability Computer

A MACHINABILITY COMPUTER now available can be fed information on 13 or more machining variables and then quickly come up with the answer to an unknown 14th. This may be the most effective **cutting speed,** a probable **tool life,** or **horsepower** required . . . or all three. The variables can be so juggled as to indicate the optimum **combination** of conditions, or the effect of a change to be made in any one variable.

Within a few minutes, the computer will solve a series of problems that would normally require several hours of computations. In the past, job planning has usually been done by some short-cut procedure in which only a few of the variables were evaluated. With use of the new computer, the same engineers will now come up with predetermined job data that is more reliable and arrived at in less time.

The instrument was developed by Dr. W. W. Gilbert of General Electric's Manufacturing Services Division, and formerly with the University of Michigan. The so-called "Gilbatron" was thoroughly tested by G. E. manufacturing operations, is being manufactured by G. E.'s Instruments Department, and will be marketed by Carboloy Department of G. E.

The new $500 computer provides for practical everyday use of ordinarily voluminous data and formulas, much of which is not readily available to the average plant or engineer. An exhaustive search was made of all the available research findings on machinability. This information was correlated with extensive G. E. experience and machining standards to provide reliable data with which to calibrate the instrument for each of numerous variables.

Unlike its more famous and more costly predecessors in the computing field, the "Gilbatron" is a low-cost, self-powered, portable unit that requires neither physicist nor advanced mathematician. It is, however, no substitute for brains and can be effectively used only by someone well versed in cutting tool application. Its principal advantages will be in time savings and in assuredness of decision, relative to predetermined job standards.

The instrument will predict, with good reliability, tool performance on both short and high production and on a variety of operations. It will balance capability of the cutting tool against possibilities of the machine tool. It will permit a more accurate evaluation of super-speed machining, and may show that it is more advisable to run at lower speeds for needed tool life. In general, it will be extremely helpful to a great many people.

MACHINING VARIABLES

1. Work Material	2. Cutting Tool	3. Cutting Conditions
Composition	Tool mat'l	Tool life
Microstructure	Flank wear	Cutting fluid
Hardness	Tool profile	Feed rate
Surface condition	Type of tool	Depth of cut
hp/cu in/min	No. of edges	Diameter of work

. . . Hardening, from page 58

one motor generator set; the items illustrated being but 75 out of a total of 142 engine and compressor parts. The weights of the parts vary considerably, from a ½-oz set screw to a 186-lb crosshead pin.

Induction hardening of large wrist pins has realized a reduction in time of about 300%. In the former method of heat and quench, 100 wrist pins were hardened in 13½ hrs; whereas, the same number of wrist pins could be induction hardened in but 3½ hrs. Push rod buttons, which formerly required 3 min. for hardening, could be induction hardened in but 15 sec. In actual application, 1,800 items can be induction hardened in 12 man-hours; this representing 12 different parts and perhaps 6 different setups. In addition, induction hardening eliminates straightening and reduces finish grinding time.

The induction hardening of axle shafts has proved economically sound on a production basis. Substantial savings have been realized through increased production, elimination of operations previously performed under the old procedure for hardening, and by the realization of a material savings in that a plain carbon steel replaced an alloy steel previously required to obtain the desired physical properties.

A progressive hardening cycle is employed. The direction of travel of the shaft through the inductor block is from spline to taper end. The rate of downward travel of the shaft is 0.277″ per second, and the rate of rotation upon its own axis during this downward travel is 76 rpm. The total depth of induction heating is from 0.200″ to 0.250″ while the effective hardened depth measures 0.100″ to 0.120″. These values remain fairly uniform throughout the length of shaft in spite of diameter changes. The axle shaft, produced from C1033, is induction hardened to a surface hardness of Rockwell C52 to C56. The shaft is then locally drawn by induction at the short taper area

Courtesy The Ohio Crankshaft Company, Tocco Division.

Fig. 7. Operator positioning a shaft in one of the stations shown in Figure 6.

where the hardness is reduced to Rockwell C34 to C38. It is then immediately conveyed to a continuous draw furnace operating at 525° F on a cycle of 1¼ hrs; the Rockwell hardness of the shaft being reduced to C42 to C48.

Another application of induction hardening, a 24″ sprocket, is illustrated in Figure 9. In a previous method, the hardening procedure required a time factor of 7 min. per sprocket. By induction hardening, with an automatically controlled hydraulic fixture, one pair of sprockets can be hardened every 6 min., to a surface hardness of from Rockwell C51 to C58. The rapid, localized heating eliminates distortion. Note the inductor employed, with spray heads for quenching.

One application of induction heating has effected a considerable savings in nickel. It involved a 272-lb final drive gear for a 17.5-ton tractor. The pitch diameter of the gear is

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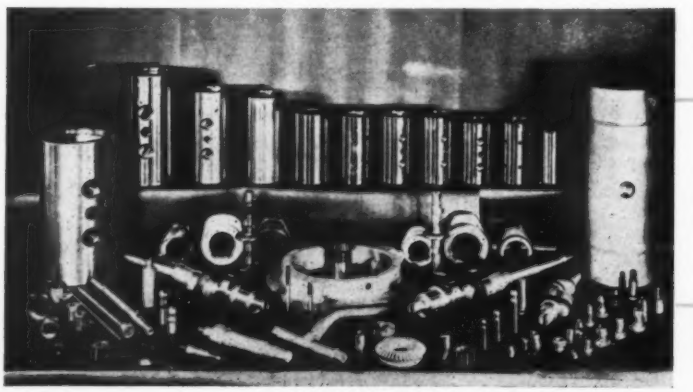

Fig. 8. By suitable fixturing and inductor design, these 75 parts, of extensive variety, can all be induction hardened in one machine.

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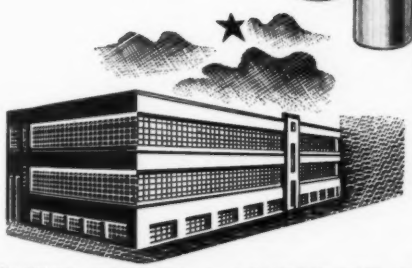

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. . . Month's Talk, from page 33

of technical requirements. For example, let us again look at the case of the lathe powered by an a-c motor and a manually operated switch. The manufacturer in signing the contract guaranteed that the lathe would conform to the requirements of Specifications MIL-I-16910A. The Naval Inspector in requesting the contractor for proof of such conformance, asked for test data from a laboratory to verify the conformance of the lathe with the specification. Instead, the manufacturer provided the Inspector with evidence that the motor used was an alternating current motor without commutator or slip rings, and did not produce interference in excess of the requirements of Specification MIL-I-16910A. The contractor can refer the Naval Inspector to paragraph 4.1.2 of Specification MIL-I-16910A which states "In general, the following types of equipment are usually inherently interference free, and therefore interference reduction is not required." There follows a listing of many equipments, among which is included "motor, squirrel cage."

When a manufacturer receives an invitation to bid on a Navy contract, he should very carefully examine the radio interference reduction requirements. If Specification MIL-I-16910A, is referenced, he should then examine the electrical components and circuitry of the equipment he proposes to furnish. If he has previously manufactured and sold identical equipment to the Navy, and it was required under the previous contract to be interference free to Specification MIL-I-16910, then the manufacturer can refer to paragraph 4.1.3 of this "spec" which states that if the equipment he proposes to furnish is identical to that which was previously furnished and tested (in accordance with Specification MIL-I-16910) and was found satisfactory and accepted, no further testing for radio interference will be necessary. He should then forward a copy of the previous test report or refer to it by letter to the bureau or agency concerned to verify the previous test results.

If the manufacturer has not previously furnished such equipment under these interference reduction requirements, then he

may use the check-off lists that the Bureau of Ships has designed for manufacturers' use in analyzing his problem. From the first paragraph, you will see that the purpose of this list is to enable prospective bidders to determine whether their product may have objectionable radio interference. It may be used whenever MIL-I-16910 is a part of the procurement specifications. An analysis of the equipments, using this convenient check list, will assist in determining the interference potentialities of the equipment. After spaces for identification of the company, a brief description of the product, and the procuring agency, you will find two categories of electrical components. Category A lists components which are basically interference-free, and which when used require no radio-interference tests. Category B includes electrical components which may produce objectionable radio interference. There are three conditions of operation, and appropriate boxes are opposite each of the named items to indicate frequency or duration of operation of the items. Many machine tool manufacturers fill out these check lists and return them to the Navy. By careful analysis of these check-off lists, we have been able to greatly assist the manufacturers in complying, at the lowest possible cost, with MIL-I-16910. We have often been able to recommend the use of equipments in category A instead of those in category B, and thereby eliminate the necessity for radio-interference tests.

By far the greatest difficulty experienced in obtaining conformance with interference reduction requirements is that too many manufacturers do nothing about reducing radio interference until their product is ready for inspection by the Naval Inspector. Then it is too late to do a really effective job, and the manufacturer is caught in the middle. He wants to make deliveries in accordance with the delivery date in the contract, but he also must comply with the interference reduction requirements of the specification. The Navy does not want to see the manufacturer default the contract by being late in delivery. Neither can the Navy accept

. . . Continued on page 70

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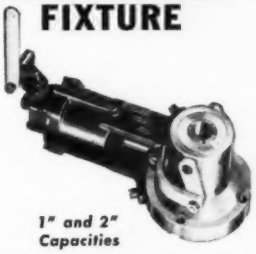

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Manual or mechanical control is optional on the "Air-O." The cam or chain can be readily connected. Solenoid operation is possible for the valve control. Parts are interchangeable. Far out-speeds hand operation.

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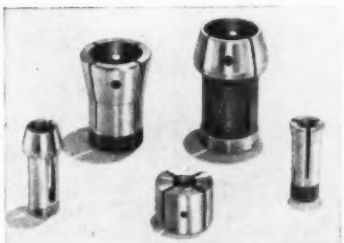
Zagar chucks are easily adapted to any make of lathe, grinder or rotating spindle. Handles bar stock—lengthwise, with no movement. Speeds loading and unloading. Can be opened and closed while machine is running.



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Five types: No. 310 Zagar Master; Nos. 2 and 6 W. & S.; No. 5-C; No. 6 W. & S. pads. All but Zagar No. 310 are standard machine tool sizes. All collets are made of oil-hardened tool steel; have flat tops for locating purposes.

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CIRCLE INFORM-A-GRAM KEY NO. 701

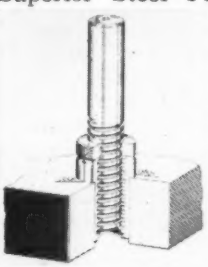
. . . Month's Talk, from page 69

equipment for naval use, (particularly on shipboard, near sensitive electronics installations, or at radio receiving stations), which would cause interference to communications. Machinery builders are strongly advised to consider radio interference reduction before they bid on a contract. Before starting work on the machine, or ordering parts for its construction, all builders should avail themselves of the technical information that can be provided by the Navy in guiding them into the purchase of items that are basically interference free and do not require radio interference tests. When an item does create interference, builders should go to those people who have the necessary experience and who can properly advise them so that they can comply with our radio interference reduction requirements with minimum cost and delay.

Adjust Removable Guide Pin to Die Shut Height

The adjustable feature of the newly-improved Spira-Lock, a removable guide pin, assures maximum rigidity and eliminates cutting or grinding the tops of pins when the removal and replacement of dies for recutting or sharpening results in a new shut height.

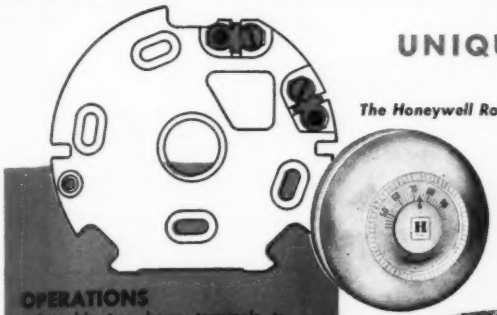
The Spira-Lock, a product of Superior Steel Products Corp. of Milwaukee, has a special threaded end to fit a threaded bushing. Any variation in shut height is compensated for by a turn of the screw end. With the pin at the proper height, it is pressed or driven down until the thread of the pin is press fit into the bushing thread.



Removal of the pin is done by releasing the lock nut, driving the pin down until the threads are in line, and unscrewing the pin. This may be done in the press without turning over the die shoe.

Bodine CASE HISTORY NO. 40

UNIQUE TOOLING SAVES 90% LABOR



The Honeywell Round

OPERATIONS

Assemble two brass terminals to plastic back plate. Tap 5 holes—auto-feed & insert two screws. Inspect for screws & terminals.

PRODUCTION DATA

Previous method, 8.5 hours labor per 1M assemblies. New method, 0.81 hours labor. 7.69 labor hours saved per 1M assemblies. Machine time 1500 cycles per hour. Acceptability of production 94%.

Minneapolis-Honeywell's attractive room thermostat depends upon this unique tooling set-up for economical volume production of the plastic back plate terminal block assembly shown at left. Labor hours have been reduced to about ONE TENTH of previous operations, thanks to this Bodine 42-30 Machine. It's just one example of the versatility of Bodine machines as they lend themselves for special tooling to meet specific job requirements.

UNUSUAL TOOLING FEATURES: This complete assembly is now made in one cycle of a Bodine 42-30 Machine. The two presses stamping the terminal blanks are coupled to and cycled by the machine, feeding stampings continuously as shown. Terminals are cut-off, inserted and formed over at station one. Back plates are magazine fed. Operator's functions are largely limited to keeping back plate magazine filled and replenishing coils of brass stock on presses.

At end of operation, two inspection probes, advanced from below, test for properly filled screw terminal holes, automatically discard rejects.

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. . . Hardening, from page 66

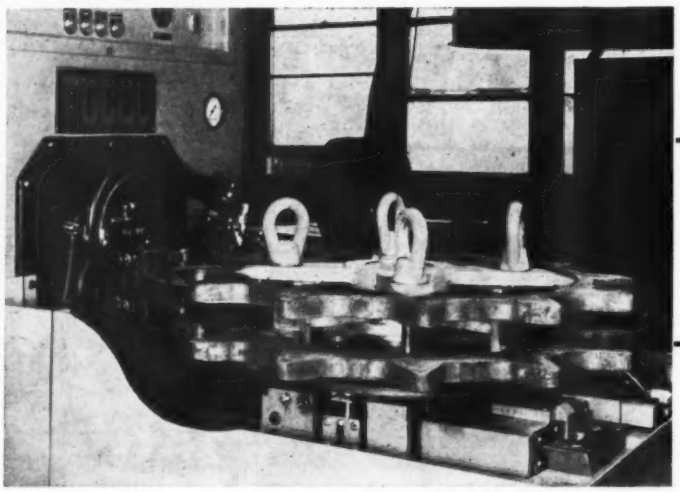

Fig. 9. A "two-passenger", indexing fixture for the induction hardening of sprocket teeth.

Courtesy The Ohio Crankshaft Company, Tocco Division.

25.7″ while the tooth face width is 5″. When a plain carbon steel (SAE 1045) replaced a 3½% nickel alloy steel, a savings of 144,000 lbs of nickel per year was realized. The prior structure procedure was employed to increase rapidity of solution during induction heating; the treatment consisting of heating the rough machined gear to 1500° F, followed by water quenching and then a high draw to obtain a 197 to 229 Brinell. The gear is pre-heated to about 600° F and placed on a rotating table where the gear teeth are induction hardened; the inductor coil clearing the work by 5/16″. Due to a delay of 14 sec between end of hardening and beginning of quench, these two functions of heat and quench can be separate. A temper of 300° F is employed. The surface hardness is within limits of Rockwell C50 to C60, the C50 penetrating 0.125″ to 0.140″ at the pitch line.

Bar stock can be hardened uniformly; the workpiece diameters of from ⅜″ to 3″, regardless of length, passing through an inductor assembly having a specific power input and at controlled rates so that the work is heated uniformly throughout to the hardening temperature. Forward motion carries the bar into a quenching chamber from which it emerges in the fully hardened condition. The bar is then passed through another inductor, of controlled power input, which re-heats to a pre-determined drawing temperature. The end product is clean, straight and of uniform structure from bar to bar. A typical performance is for one man to heat-treat one ton of 1″ SAE 1045 per hour; the hardness after quenching being from Rockwell C63 to C64. In the drawing operation, the Rockwell hardness is reduced to C30 to C31.

Conclusion

In the discussion of the various applications in which induction hardening is employed, many of its advantages have been covered. It should be realized, however, that induction hardening has limitations; a few of these limitations, given by Martin and Gehr[5], being:

(a) Parts requiring complete hardening are at times not suited for induction hardening due to the higher cost of energy.

(b) Very thin or extra large sections present difficulties in hardening, usually due to the limitations in both frequency and power ratings of available electrical equipment.

(c) Both edges and corners of specimens tend to heat faster, complicating the problem of contour hardening.

(d) Limitations in the automatic timing equipment may present inconsistencies in hardening and quenching of critical parts.

(e) Maintenance of the electrical equipment would necessitate the services of a trained technician.

(f) Induction hardening requires close control of both composition and structure of material selected.

(g) Each application of induction hardening presents the complication of establishing a cycle by trial and error, which should be done under the supervision of a metallurgist.

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1. "Three Million Axle Shafts Induction Hardened", S. L. Widrig and C. A. Payntor, Iron Age, December 21, 1950.
2. "Casehardening Large Gears with High Frequency Current", G. C. Riegel, Metal Progress, July, 1943.
3. "Induction Heating", L. F. Spencer, Steel Processing, Jan., Feb. 1953.
4. "Induction Heating", H. B. Osborn, Jr., Bull. No. 22, Ohio Crankshaft Co., Cleveland, Ohio.
5. "Tocco Induction Heating", Ohio Crankshaft Co., Tocco Div., Cleveland, Ohio.

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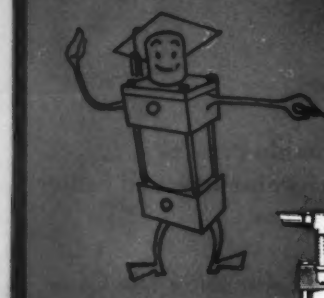

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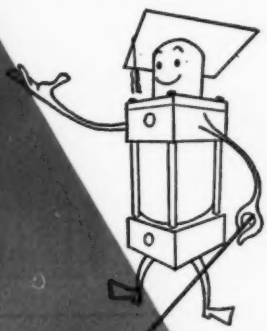

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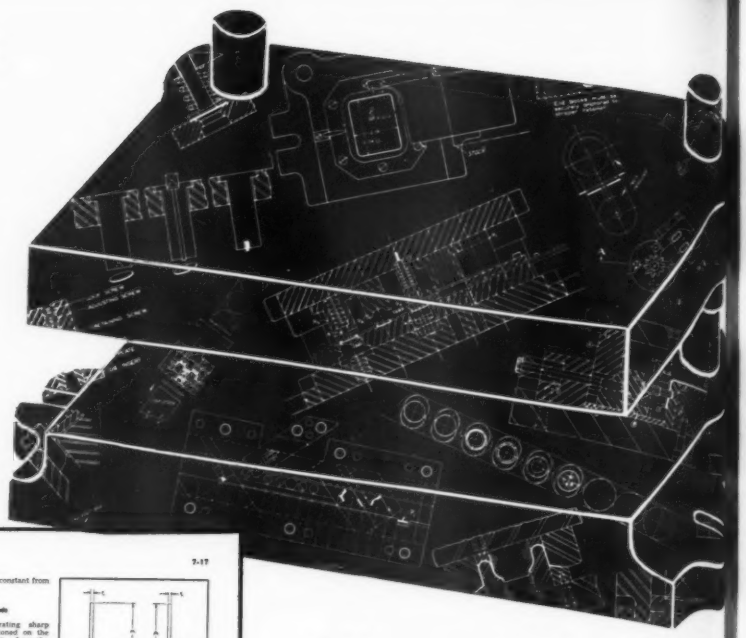

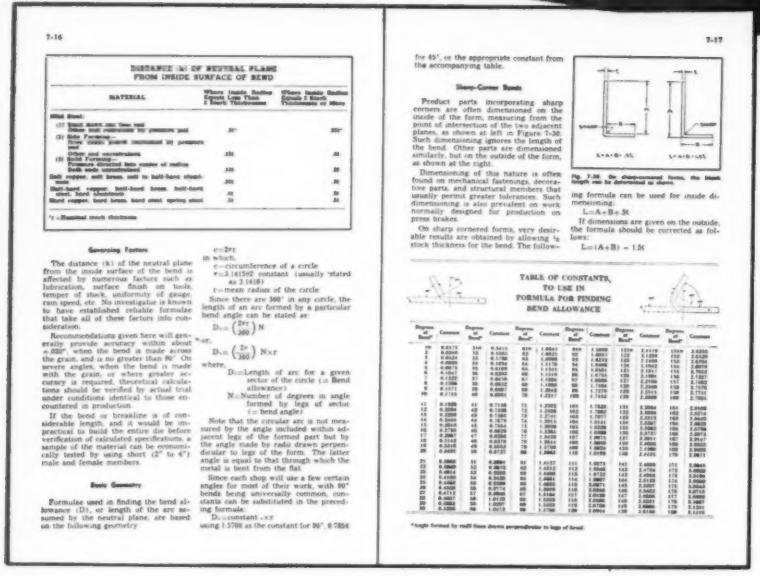

7-16

DISTANCE (k) OF NEUTRAL PLANE FROM INSIDE SURFACE OF BEND

MATERIAL	Where Inside Radius Equals 1 Stock Thickness	Where Inside Radius Equals 2 Stock Thicknesses or More
Mild Steel:		
(1) Sheet, short cut, fine, and other soft materials for pressure pad	.5*	.5*
(2) Side Forming— Steel, coarse grained, annealed by pressure pad	.33	.4
Other and recrystallized	.33	.4
(3) Solid Forming— Pressure directed into center of radius	.33	.5
Both ends constrained	.33	.5
Soft copper, soft brass, soft to half-hard aluminum	.33	.5
Half-hard copper, half-hard brass, half-hard steel, fixed (doubtful)	.4	.5
Hard copper, hard brass, hard steel, spring steel	.5	.5

*t = Standard stock thickness

Governing Factors

The distance (k) of the neutral plane from the inside surface of the bend is affected by numerous factors such as lubrication, surface finish on tools, temper of stock, uniformity of gauge, ram speed, etc. No investigator is known to have established reliable formulas that take all of these factors into consideration.

Recommendations given here will generally provide accuracy within about ± .020", when the bend is made across the grain, and a no greater than 90°. On severe angles, when the bend is made with the grain, or where greater accuracy is required, theoretical calculations should be verified by actual trial under conditions identical to those encountered in production.

If the bend or breakline is of considerable length, and it would be impractical to build the entire die before verification of calculated specifications, a sample of the material can be economically tested by using short (2" to 4") male and female members.

Basic Geometry

Formulas used in finding the bend allowance (D), or length of the arc assumed by the neutral plane, are based on the following geometry

c=2πr
in which,
c=circumference of a circle
π=3.141592 constant (usually stated as 3.1416)
r=mean radius of the circle

Since there are 360° in any circle, the length of an arc formed by a particular bend angle can be stated as:

$$D=\left(\frac{2\pi r}{360}\right)N$$

or,

$$D=\left(\frac{2\pi}{360}\right)Nxr$$

where,
D=Length of arc for a given sector of the circle (=Bend allowance)
N=Number of degrees in angle formed by legs of sector (=bend angle)

Note that the circular arc is not measured by the angle included within adjacent legs of the formed part but by the angle made by radii drawn perpendicular to legs of the form. The latter angle is equal to that through which the metal is bent from the flat.

Since each shop will use a few certain angles for most of their work, with 90° bends being universally common, constants can be substituted in the preceding formula:
D=constant x r
using 1.5708 as the constant for 90°, 0.7854

7-17

for 45°, or the appropriate constant from the accompanying table.

Sharp-Corner Bends

Product parts incorporating sharp corners are often dimensioned on the inside of the form, measuring from the point of intersection of the two adjacent plates, as shown at left in Figure 7-20. Such dimensioning ignores the length of the bend. Other parts are dimensioned similarly, but on the outside of the form, as shown at the right.

Dimensioning of this nature is often found on mechanical fastenings, decorative parts, and structural members that usually permit greater tolerances. Such dimensioning is also prevalent on work normally designed for production on press brakes.

On sharp cornered forms, very desirable results are obtained by allowing ½ stock thickness for the bend. The following formula can be used for inside dimensioning:

L=A+B+.5t

If dimensions are given on the outside, the formula should be corrected as follows:

L=(A+B)−1.5t

Fig. 7-20. On sharp-cornered forms, the blank length can be determined as shown.

TABLE OF CONSTANTS, TO USE IN FORMULA FOR FINDING BEND ALLOWANCE

Degrees of Bend*	Constant	Degrees of Bend*	Constant	Degrees of Bend*	Constant	Degrees of Bend*	Constant	Degrees of Bend*	Constant
10	0.0175	34	0.5411	58	1.0647	82	1.6005	106	2.1118
11	0.0192	35	0.5585	59	1.0821	83	1.6179	107	2.1293
12	0.0209	36	0.5760	60	1.0996	84	1.6353	108	2.1468
13	0.0227	37	0.5934	61	1.1170	85	1.6528	109	2.1642
14	0.0244	38	0.6109	62	1.1345	86	1.6702	110	2.1817
15	0.0262	39	0.6283	63	1.1519	87	1.6877	111	2.1991
16	0.0279	40	0.6458	64	1.1694	88	1.7051	112	2.2166
17	0.0297	41	0.6632	65	1.1868	89	1.7226	113	2.2340
18	0.0314	42	0.6807	66	1.2043	90	1.7400	114	2.2515
19	0.0332	43	0.6981	67	1.2217	91	1.7575	115	2.2689
20	0.0349	44	0.7156	68	1.2392	92	1.7749	116	2.2864
21	0.0367	45	0.7330	69	1.2566	93	1.7924	117	2.3038
22	0.0384	46	0.7505	70	1.2741	94	1.8098	118	2.3213
23	0.0402	47	0.7679	71	1.2915	95	1.8273	119	2.3387
24	0.0419	48	0.7854	72	1.3090	96	1.8447	120	2.3562
25	0.0437	49	0.8028	73	1.3264	97	1.8622	121	2.3736
26	0.0454	50	0.8203	74	1.3439	98	1.8796	122	2.3911
27	0.0472	51	0.8377	75	1.3613	99	1.8971	123	2.4085
28	0.0489	52	0.8552	76	1.3788	100	1.9145	124	2.4260
29	0.0507	53	0.8726	77	1.3962	101	1.9320	125	2.4434
30	0.0524	54	0.8901	78	1.4137	102	1.9494	126	2.4609
31	0.0542	55	0.9075	79	1.4311	103	1.9669	127	2.4783
32	0.0559	56	0.9250	80	1.4486	104	1.9843	128	2.4958
33	0.0577	57	0.9424	81	1.4660	105	2.0018	129	2.5132

*Angle formed by radii lines drawn perpendicular to legs of bend.

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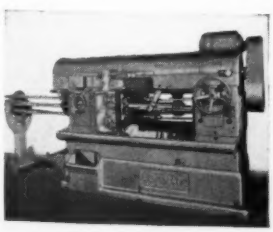

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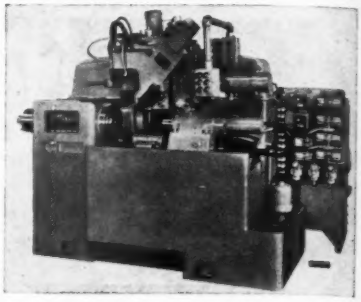
The new HD-8 tracer lathe introduced by Hydra-Feed Machine Tool Corp. not only permits the turning of complex shapes while reducing the chance for human error, but also has the rigidity and power to take sizeable cuts, thus reducing machining time.

Location of the lathe's tracer slide on the top carriage lessens the possibility of chips, dirt, etc., getting onto the slide and interfering with efficient operation. The unobstructed front of the machine permits easy loading, unloading, and checking of work.

Machines can be supplied with either a constant or variable speed drive for the spindle. Also available is an auxiliary rear carriage for facing, grooving, chamfering, or any other type of cut that can be handled by a straight plunge operation. This permits an improvement in machining efficiency and can often eliminate the need for a second operation.



Either flat or round templates can be used with the HD-8 tracer lathe, and the templates can be made of relatively soft material since the light pressure of the stylus results in no appreciable wear.

Get complete information on the HD-8 tracer lathe from Hydra-Feed Machine Tool Corp., 730 W. 8-Mile Rd., Ferndale, Mich., or — **Circle D1.**

"RO" Form Relief
You get more cuts per sharpening from your tools if you leave metal to support the edge
A
B
C
A
B
C
A
B
C
A Sharpens these cutting edges with any degree of form relief.
B No undercutting at intersection — no burr on work piece.
C Diameters can be cylindrically ground or relieved as desired.
There is a constant increase in the number of shops bringing their tool grinding practices up to date by standardizing on form relief sharpening as a means of reducing tool costs. No other fixture offers the ease of set-up and operation and the flexibility of the "RO" Universal Form Relieving Fixture.
GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
29800 STEPHENSON HY.
ROYAL OAK, MICH.
WRITE FOR CATALOG
CIRCLE INFORM-A-GRAM KEY NO. 761

Oscillating Buff Polishes TV Tubes

The problem of removing defects left in the glass face of TV picture tubes after casting has been solved by a polishing machine designed and built by Acme Manufacturing Company of Detroit, Michigan. The machine also blends the contour of the face of the tube in the same operation. The glass is manually snag-ground before being placed in the machine.

The general principle involved is that the work oscillates with a rocking action while the polishing buff oscillates at right angles. Holding arrangements for handling picture tubes up to 24" or larger can be provided.

Cylindrical as well as spherical surfaces can be completely covered by this machine, suggesting application to polishing work other than TV tubes.

After starting the continuous compound pump, the picture tube is loaded into the work holder which is so designed as to hold various size tubes and to eliminate clamping. The buffing

. . . *Continued on page 83*

GROWING PAINS

The third expansion in two years is being undertaken by **Barth Corporation** in Cleveland. Its 20,000 sq. ft. addition to the main plant will allow Barth to consolidate the special machinery division and the aviation division with main plant operations.

Bostitch, Inc., pioneer manufacturer of staples and stapling machines, will move its main manufacturing plant and general offices to East Greenwich, R. I., when its new plant there is built.

The largest plant expansion in the history of the Atlantic plant of **U. S. Electrical Motors Inc.** is being undertaken at Milford, Conn. Its 63,000 sq. ft. addition will boost manufacturing space there to approximately 200,000 sq. ft. The company's national headquarters is in Los Angeles.

An addition to **Ford Motor Company's** automatic transmission plant at Livonia, Mich., is the first project in the company's new $625,000,000 facilities expansion program, according to M. L. Katke, general manager of the Automatic Transmission Division. Initial production in the new area should begin in mid-1956. Construction has begun at Ford's new Parts Manufacturing Plant near Sandusky, Ohio.

Sheridan-Gray Inc. recently moved into newly erected quarters in Torrance, Calif. The firm functions as the design and development division of T. W. & C. B. Sheridan Company of New York, designers and builders of specialized aircraft manufacturing machinery as well as printing and binding equipment.

Work is progressing in the construction of **Kaiser Aluminum & Chemical Corporation's** foil and sheet mill near Ravenswood, W. Va. By mid-1956, the Ravenswood Works will begin producing a variety of aluminum sheet and foil products.

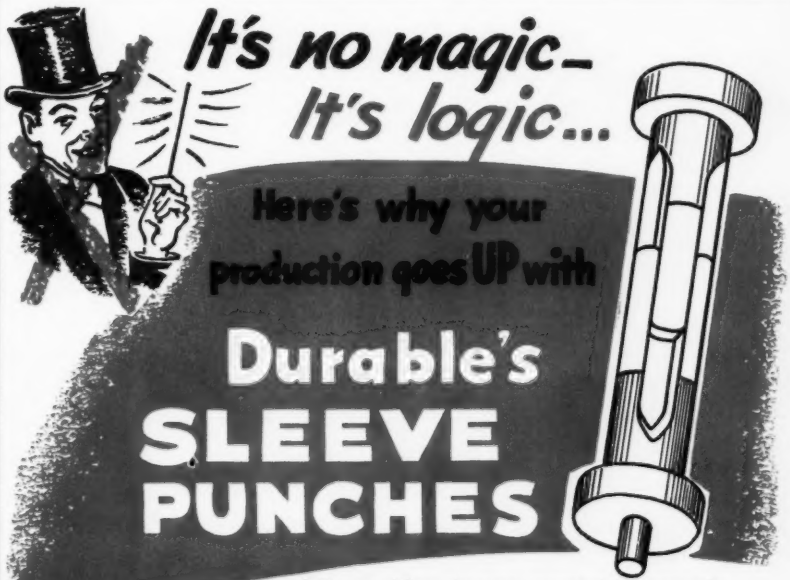
Officers of **The Mitchell-Bradford Chemical Co.,** manufacturers of protective finishes and heat treating salts, have announced the company's move to a larger plant in Milford, Conn.

Raytheon Manufacturing Company has arranged to purchase the large plant and property in Tewksbury and South Lowell, Mass., which was formerly the South Lowell Ordnance Plant, later occupied by Davis Aircraft Company. The plant's 210,000 sq. ft. of production area has been converted to electronics manufacturing facilities and has operated under lease as a Raytheon branch since 1952.

The Claud S. Gordon Company doubled its manufacturing facilities upon completion of an addition to its plant at Richmond, Ill. The company produces Serv-Rite thermocouple wire, pyrometers, and pyrometer and thermocouple accessories.

Greatly enlarged and improved facilities for the design and manufacture of materials handling equipment have been placed in service by **Heppenstall Co.** The New Brighten, Pa., plant, a rebuilt forgings plant, includes a manufacturing building covering more than 60,000 sq. ft.

Resdel Engineering Corp. of Los Angeles, manufacturers of "Electronheat" dielectric heaters for the plastics industry, has moved into its new 21,000 sq. ft. brick building.



The intermeshing sleeves support the punch throughout its entire length. Result?

1. The Punch CANNOT buckle
2. The Punch CANNOT shift off center
3. Perforates thru metal many times thicker than hole diameter.

All Durable Punches are vertically lapped, then electrocoated — Result—easier stripping, no galling, longer punch life.

Because Durable's research department constantly finds answers to difficult piercing problems—thousands of customers DEPEND ON DURABLE.

WHAT'S YOUR PROBLEM?

Whatever your piercing problem may be — DURABLE'S know-how and 18 years experience offers a quick, economical solution. Write today for full details on any piercing problem. You'll get a fast, practical reply from the most DEPENDABLE Punch and Die Manufacturer in the World!

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Patented and made exclusively by

DURABLE PUNCH & DIE COMPANY

1214 W. Madison Street, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 771

Announcing

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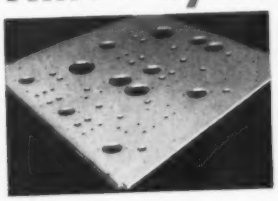
WITH

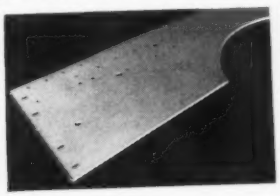
WALES *Fabricators*

Time Payments PAID OUT OF THESE SAVINGS!



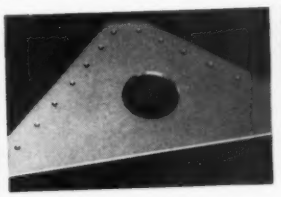
ELECTRONIC CHASSIS 12-1/2" x 11-1/2", with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in

6.44 minutes.



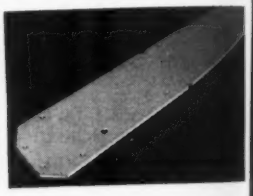
A part of FARM EQUIPMENT, 72-1/2" x 22" with 32 holes and nibbled cut out was finished including setup in only 12.01 minutes, subsequent pieces in

2.32 minutes.



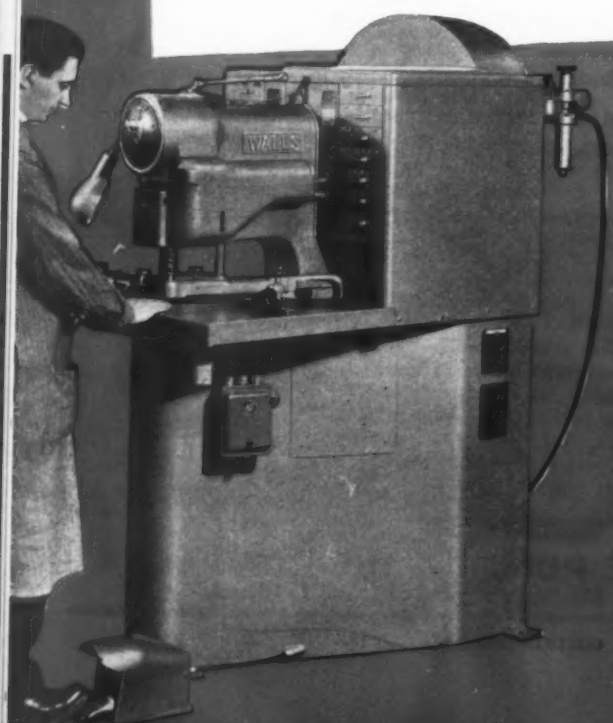
AN AIRCRAFT part 7-1/2" x 4-1/2" with 15 holes and 1 notch was produced including setup in only 3.52 minutes and subsequent pieces in only

54 seconds.



Part of an ELECTRIC REFRIGERATOR, 39-7/8" x 8-1/2" with 10 holes and 4 notches was fabricated including setup in only 5.61 minutes and subsequent pieces in only

37 seconds.



Check the difference between your present methods of production to make the above parts and the typical astounding time studies produced on Wales Fabricators, *the only machine of its kind.*

Designed for rapid interchangeability of punches and dies for hole punching, notching and nibbling operations, Wales Fabricators permit working direct from blueprints or operation sheets . . . *no templates required.*

Write today for complete information on Wales Fabricator Pay-As-You-Produce Plan that more than pays for itself out of savings.

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555 **Payne Avenue, North Tonawanda, N. Y.**

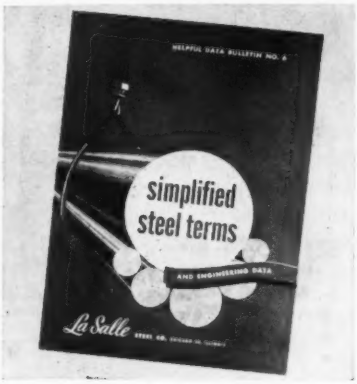
(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Use postage-free Inform-A-Gram Key Number Card for your request

Terms Defined in the 32-page dictionary of steel terms titled "Simplified Steel Terms and Engineering Data" range from annealing and austempering through isothermal quenching and macro-etching to spheroidizing, stress relieving, and yield strength. More than 30 photos, curves, and tables cover subjects such as standard grain sizes for steels, Shepard grain size fracture standards, approximate hardness



conversion number based on Brinell, and izod toughness vs. tensile strength of heat treated steels. La-Salle Steel Co., Chicago 80, Ill.
Circle Inform-A-Gram No. C1.

That Light-Weight Metal, Titanium, is Spotlighted Again in Mallory-Sharon's booklet, "Machining Recommendations for Titanium." The data is based on basic machining information accumulated through fabrication experience and research studies. These indicate that commercially pure titanium machines similar to 18-8 stainless steel. The alloy grades machine somewhat harder but do not approach the difficult-to-machine high temperature alloys, says M-S. Since the variations and exceptions in machining titanium are numerous for efficient operation, an approximation of titanium machinability is not sufficient. Thus, the informative bulletin contains specific recommendations — in easy-to-follow tabular form — for turning, milling, drilling, tapping, grinding, reaming, and sawing. Get a copy direct from Mallory-Sharon Titanium Corp., Niles, Ohio, or —
Circle Inform-A-Gram No. C2.

Compressed Air Users Can Improve the Capacity of their installations by following the suggestions and hook-up sketches contained in Sarco's Bulletin No. 520-A, "Is Your Air Compressor Capacity Effective?" It discusses air intakes, cooling systems, safety pressure switches, aftercooling condensation, drain traps, receivers, distribution lines, and separators and tells how to check leakage loss and how to size distribution lines. Sarco cooling controls for compressor jackets, aftercoolers, and intercoolers are briefly described in the 8-page booklet. Get yours from Sarco Co., Inc., Dep't P, Empire State Bldg., New York 1.
Circle Inform-A-Gram No. C3.

"Roll Surface Finishes" is one of the few reports published on the subject to aid mill engineers and machine designers in the metalworking, plastics, paper, and other roll-using industries in the economical selection of proper rolls. Rodney Hunt's Report No. 6 discusses instruments used to measure surface roughness and ways to prepare and correct finishes on rolls. A chart lists average time required to attain various degrees of surface finish on steel rolls and assists in the selection of proper roll surface finishes for various types of usage. Get your copy from Rodney Hunt Machine Co., Dep't IR, Orange, Mass., or —
Circle Inform-A-Gram No. C4.

Do You Use Felt for washers, wicks, seals, or for any other applications? If so, or if you're contemplating the use of the material, you'll find the selection of samples and data sheets on S.A.E. standard felts from American Felt Co. are invaluable. Weights, thicknesses, densities, and chemical and physical properties of S.A.E.-rated felts are not only listed, but the brochure contains actual samples of the fabric. Application possibilities are comprehensively outlined. Get the "S.A.E. Felts" brochure from American Felt Co., Glenville, Conn., or —
Circle Inform-A-Gram No. C5.

Complete With Helpful Lists of Do's and Don'ts to prolong bearing life, Bulletin No. 506, "Lubrication and Maintenance of Ball and Roller Bearings," also includes valuable information on the storage and handling of lubricants. The 4-page booklet is yours from New York & New Jersey Lubricant Co., 292 Madison Ave., New York 17, N. Y., or —
Circle Inform-A-Gram No. C6.

"Application of Nitriding to Hot Forging Dies" tells how the life of closed-impression forging dies is definitely improved by the application of surface hardening by the nitriding process. The informative article is available from the Metal Treating Institute, 271 North Ave., New Rochelle, N. Y., or —
Circle Inform-A-Gram No. C7.

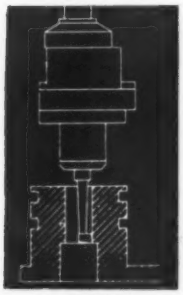
Master Balls Solve Many Problems in toolroom and production gaging, including setting external gages and comparators, determining the location of existing holes and grooves, and measuring hole dimensions. This latter application — measuring hole dimensions — is the subject of a new bulletin from Industrial Tectonics. Specific topics covered in the booklet include checking depth of drilled holes, checking angle and diameter of internal tapers and locating the apex of the cone, and measuring the diameter of cylindrical holes using two and four balls. More than 50 equations are given for these and related applications, together with explanatory drawings and examples. For your copy of "Super-Precision Master Balls" write to Industrial Tectonics, Inc., Ann Arbor, Mich, or— **Circle Inform-A-Gram No. C8.**

A Boring Head That Won't Face is NOT Complete

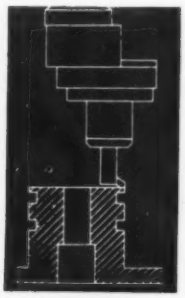
CHANDLER-DUPLEX Does ALL IN 1 SET-UP

BORING
FACING
TURNING
GROOVING
UNDER-CUTTING

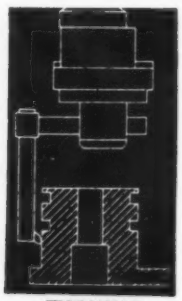
The **CHANDLER-DUPLEX** Combined Boring and Facing Toolhead has many features not found in ordinary makes . . . such as power feed for facing, longer slide travel, extremely fine adjustment, tee slot positioning of cutting bar, universal range and adaptability.



BORING



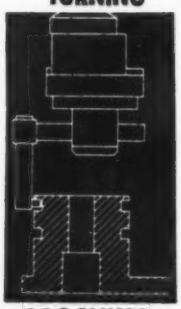
FACING



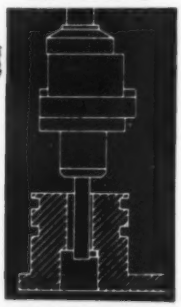
TURNING

CHANDLER-DUPLEX *combines* boring and facing — permits all these operations in one set-up. Built for efficiency, accuracy and stamina.

A Model for Any Size Machine



GROOVING



UNDERCUTTING

Write today for full details and Catalog on this combined Boring and Facing Toolhead

CHANDLER TOOL CO.
Munoie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

CIRCLE INFORM-A-GRAM KEY NO. 801

. . . Feed Indicator, from page 14

Fig. 2. Compactness permits the operator to make speed adjustments and at the same time read the meter. The pickup unit is magnetically held on the machine slideway.

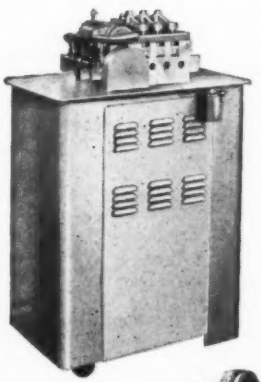
with the pull magnet in contact with the slide, Figure 2. The hold-down magnet will hold the pickup unit in position on the slideway. Start the machine slide in the traverse to be measured. The pull magnet will pull out the pickup rod as the slide moves away.

The pickup unit is a slide wire potentiometer which causes voltage changes as the slide moves. This voltage rate of change is amplified and fed into the milli-ammeter which is graduated to read "inches-per-minute."

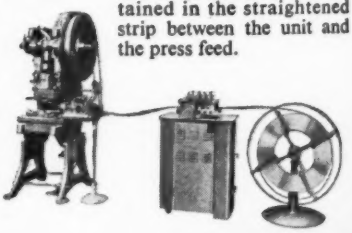
The "push" pickup is similar to the "pull" pickup described above. The meter will read correctly for either method of operation.

Economy · Dependability

WITTEK
STOCK STRAIGHTENERS



Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars
WITTEK Manufacturing Co.
4323 W. 24th Place • Chicago 23, Illinois

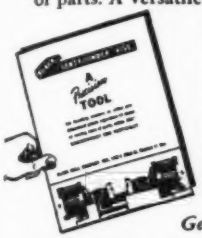
Production Feeding Equipment

S577

CIRCLE INFORM-A-GRAM KEY NO. 802

RELOCATE AUTOMATICALLY FOR SECOND OPERATION-BORING WITH BLACK "CENTR-FINDER" VISE

Relocating for second operation-boring is fast and accurate with a Black "Centr-finder" vise. Locates centers and other pre-determined points within .001" vertically and horizontally, regardless of shape or size of parts. A versatile tool—for drilling, reaming, chamfering and many other operations.



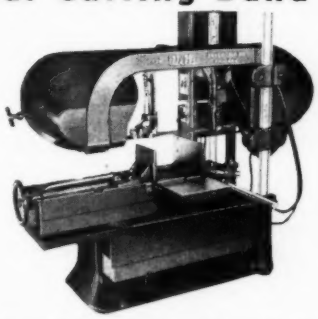
Working range is 0 to 4". Clamping pressures up to 2000 pounds. Force exerted is all straight line. Vise jaws travel on guides—actuated by opposed double-acting cylinders . . . synchronized by mechanical means. No pressure exerted through synchronizing mechanism.

Get all the facts—write for bulletin.

THE BLACK DRILL COMPANY, INC.
1368 East 222nd Street • Cleveland 17, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 811

New Ease of Control With the Wells Model 1200 Metal Cutting Band Saw



The Wells model 1200 is a rugged, new horizontal band saw for heavy-duty production cutting. It incorporates all the advantages of the Wells No. 12 plus such outstanding advancements as Finger-Tip Control and greater safety with *110 Volts at the controls.* And with the flip of a switch, the model 1200 becomes a completely automatic machine with continuous operation for duplicate cutting when used with the Wells-O-Bar Feed Master stock projection unit.

Call your Wells Distributor or write for Job-Engineering Service.

Wells

The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORP.
1940 CEDAR ST., THREE RIVERS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 812

Identical Twins

Republics consistent good quality gives nature a run for it's money!

Confidence that every spec will be closely adhered to – that the next gage will be just as perfect as the last—consistency in quality – this is the important thing that appeals to quality control men and the reason so many of them regularly specify Republic.

- Thread Plugs and Rings
- Plain Plugs and Rings
- Pipe Plugs and Rings
- Reversible thread and plain plugs
- Measuring wires
- Thredmasters

COMPLETE ORDERING DATA

Metalworking plants will find this comprehensive catalog an important buying aid

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2228 Fenkell Ave.
Detroit 21, Michigan

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SWISS PRECISION MEASURING TOOLS

Odd Flutes Micrometers, Direct Reading Micrometers, Test and Dial Indicators, Bore Gages, Height Gages, Verniers, Protractors, etc.

Import, Sales and Service by

ERNEST E. DIENER CO.
4779 Korte Ave., DEARBORN, Michigan

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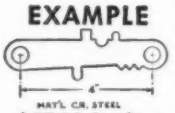
A SMALL LOT
METAL STAMPING SERVICE
AT LOWEST POSSIBLE DIE COST

FIRST...In Experience • In Know-how • In Research • In Quality • In Service

The sketch briefly describes the cost of a typical part made for one of our thousands of customers.

We have a short run stamping service to offer beyond comparison.

EXAMPLE



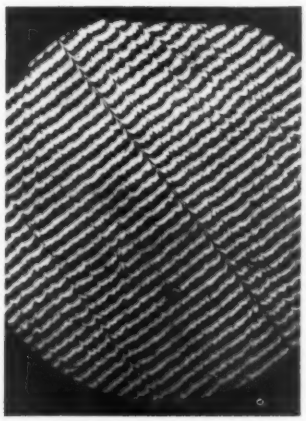
$57.50 for first 100 pieces including tools. $5.50 for each additional 100 pieces plus material.

Factory trained representatives in all centers. Write for full details.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA
CIRCLE INFORM-A-GRAM KEY NO. 822

. . . Finished Surfaces, from page 54

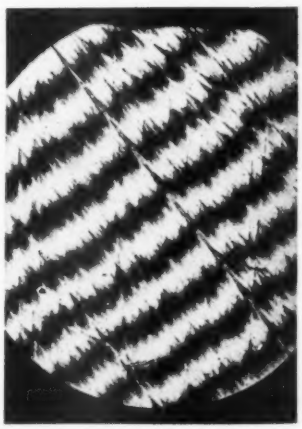
instrument is designed to be used by operators without specialized training. Surfaces which cannot be placed on the microscope because of size or inaccessibility can still be inspected by



Photomicrograph of a lapped surface with a reading of less than one micro-inch RMS, as measured by a Profilometer. Straightness of interference bands indicate flatness. The width of a combined dark and light band is 11 millionths of an inch. The scratch indicated by the row of peaks in the bands cutting diagonally across the center of the sample is about 13 millionths of an inch deep.

a process which is roughly comparable to "lifting" a fingerprint. A special lacquer is spread on the surface. After it has dried, it can be peeled off. The strip of lacquer can be viewed through the microscope, and the results obtained in this fashion are very satisfactory.

While the possibilities of the interference microscope have not yet been fully explored, it has already proved its worth in several in-



Same sample and same magnification, except that bands have been spread to accentuate the surface variations for ease in measuring. Lenses can be rotated so as to place bands at right angles to scratches for accurate measurements of scratch depths.

stances. In one case, for example, a customer returned a piece of experimental work because a mark on the finished surface seemed to be a dent which he assumed had been caused by careless handling after lapping. Inspection on the microscope revealed that the imperfections could not be dents because there were no raised edges as are characteristic of a deformed area. It was finally decided that the marks were due to inclusions in the metal itself. This investigation enabled the customer to improve his product by establishing more rigid specifications in ordering steel.

. . . Polishing Buff, from page 76

spindle is automatically lowered at the same time the tube moves from the loading position. When the buff approaches within ¼" above the tube, compound is automatically released through a hollow buffing spindle and spread over the entire face of the tube due to the oscillating of both part and buffing spindle arm. Thereafter compound is released at desired intervals up to a maximum of 2 min.

A timing arrangement keeps the machine operating for a predetermined time. At the expiration of the time cycle, the tube is automatically returned to the unload position, the buff is automatically raised, the tube is given a water rinse and a signal light flashes indicating completion of the operation. This signal permits one operator to run several machines. An air-operated arrangement releases the picture tube from the work holder.

Two-Position Fixture Speeds Honing Operation

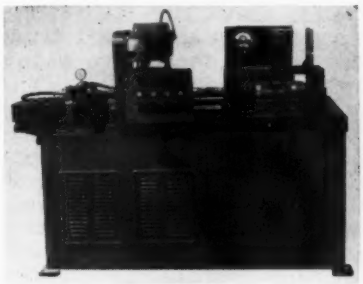
The large automatic single spindle honing machine announced by Superior Hone Corp. has a two-position fixture which can be loaded or unloaded while one piece is being honed. Model "SA" requires but one operator.

Automatic air gaging is built into the honing mandrel which, after each honing cycle, moves into the bore and gages the part just honed.

Movement of the honing head, fixture, and air gages is hydraulically controlled and actuated by solenoids.

Pressure on the stone expansion is maintained by air, which controls rapid expansion and release of the honing stones at the beginning and end of each cycle.

A pushbutton type central control panel with signal lights, located on the front of the machine, governs the entire operation other than loading and unloading. A built-in electric timer allows variable cycling for the most efficient operation.



Improved Scully-Jones Tools reduce drilling and tapping costs!

More trouble-free production is now possible on multiple-spindle machines equipped with *improved* Scully-Jones Quick-Lock Adjustable Adapters. The new "Keyhole" slot and Ejector make tool changes faster, easier, and safer. The pilot nose minimizes any tendency of adapters to bind or jam in the spindle. Your machines are protected against misalignment and damage by these easy-operating, more accurately fitting tools. And, with quick and easy adjustments of the Quick-Lock Nut, you speed setup and accurately control cutting tool depth.

More good news! Scully-Jones Drill Chucks . . . offering increased resistance to "pull-out," improved seating, and truer collet action . . . are now available from stock. The new four-slot design gives you all the advantages of small diameter, plus added protection against tool breakage and production shutdowns.

Your factory-trained Scully-Jones representative or distributor can demonstrate these advantages to you, and explain why Scully-Jones tools hold accuracy and last longer, even under hard usage.

Next time you buy *or build* a machine tool, make sure it's equipped with Scully-Jones "Precision Holding" tools.

Scully-Jones & Company
1913 So. Rockwell Street, Chicago 8, Illinois

SCULLY JONES

Let your factory-trained Scully-Jones representative or distributor help you select the right tool for the job.

SCULLY-JONES

"Precision Holding" for holding precision

Floating Holders | Adjustable Adapters | Safe-Torque Tap Drivers | Milling Machine Adapters | Close-Center Tap Drivers | Quick-Change Chucks | Heavy-Duty Tap Drivers | Drill and Tap Drivers | Recessing Tools

MAIL COUPON TODAY

FREE! ☐ Send complete data on Recessing Tools, Bulletin No. 10-50

Firm Name_____

Individual_____

Address_____

City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 831

LIQUID CONTROLS BRAZING ALLOY SURFACE FLOW

A new liquid, Nicrobraz Green Stop-Off, permits hairline control in preventing the flow of copper, nickel, and silver brazing alloys across the surface of any type of brazed assembly.

Of particular value in protecting threads, splines, small orifices, knurled areas, and cast surfaces during the brazing operation, it can be brushed, sprayed, or flowed onto all non-ferrous metals, including titanium, most alloy steels, including stainless.

Green Stop-Off coats the surface of the part with a thin layer of black non-reducible metal oxide. This oxide is relatively inert and does not contaminate a controlled brazing atmosphere. Areas that have been coated with the liquid can be easily buffed to restore original appearance.

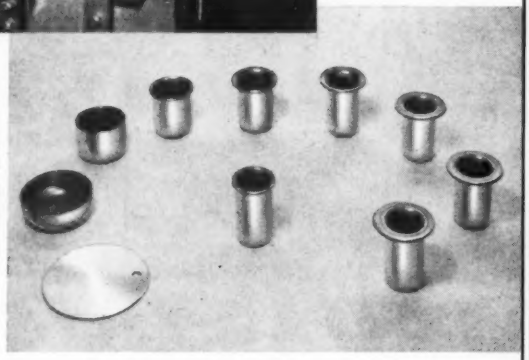
Use of this liquid manufactured by Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich., eliminates the need for a secondary grinding operation to remove excess brazing alloy. **Circle D2.**

NEW TRANSFER DIES

SAVE OVER 25% on Material

This transfer die performs 8 to 9 operations with production over 1500/hr. Transfer mechanism is built into die, thus eliminating any complicated attachments in press.

Typical parts produced, a City Tool & Die transfer die. Parts shown range from blank to finished piece.



Now you can convert *any* standard Punch Press with a money saving, labor saving transfer die. You'll save on labor, material and original machine costs. These dies have proven themselves for over 2 years—with outstanding production records.

CITY TOOL & DIE CO.
INCORPORATED
MUNCIE • INDIANA

WRITE or CALL for FOLDER TODAY!

DETROIT OFFICE
560 Maccabees Bldg. • Detroit 2, Mich.
TEmple 2-2322

CIRCLE INFORM-A-GRAM KEY NO. 841

"STROKE CONTROL" FEATURED IN NEW PRESS BRAKE

A most outstanding feature incorporated in a recently developed press brake is the "stroke control", which makes it possible to pre-set the ram travel to the most practical length of stroke for any specific job. Also the ram can be stopped or reversed at any desired point during a work cycle.

This new press brake, the Di-Arco Hydra-Power, developed by O'Neil-Irwin Mfg. Company, 626 Eighth Avenue, Lake City, Minnesota, is hydraulically operated having a capacity for developing 12 tons pressure. The length of bed and ram is 36".

In its operation power is applied to a rotary hydraulic cylinder which is mechanically linked to the cam shaft. The oscillating action of this cylinder has a maximum movement of 270°. It is important to note, that maximum power or pressure is obtained by working off the bottom of the stroke. The design of the machine is such that any length of stroke can be secured with a quick adjustment of the stroke control selector, without readjusting the bed or die settings.

Operating speed is increased because it is unnecessary for the cam shaft to go through a complete cycle each time the clutch is tripped. This is explained by

the fact that the ram does not go through a "Start — Bend — and Return to Start" working cycle. Rather, a bending cycle is completed in the forward movement of the hydraulic cylinder and another cycle is completed in the return movement of the cylinder.

Selection of a short stroke on punching operations is valuable from both a safety and speed standpoint, since the opening need only be adjusted for slightly more than the thickness of the material. A production rate of 60 strokes/min. is possible on a ¼" stroke. At the full 1½" opening, a rate of 24 strokes/min. can be maintained.

Speed of the ram on the Di-Acro Hydra-Power Press Brake can be varied by the operator by varying the amount of pressure he puts on the foot pedal. He can "inch" the ram to line up with a scribed line on material and from this line-up position he can brake material of maximum capacity over the full length of the bed. Or he can bring the ram down into bend position as slowly as he wishes on a large sheet of material to avoid the danger of material "whiplash".

Although a greater number of strokes per minute can be attained with a short stroke, the ram speed remains constant whether the stroke is short or long. Because of the constant ram speed, it is possible to form materials at a high rate of production and with safety, since the material will not "whiplash".

A less experienced operator can safely operate this press brake, because he has complete control over the speed of the ram and over the opening. He cannot damage dies, jam or lock the machine because an adjustable relief valve can be pre-set to apply only the maximum tonnage required to bend or punch the metal—beyond that amount of pressure, the machine will "throw out" or stop. Also, the operator can "back off" the ram at any point in the operating cycle by touching a reverse lever and using the foot control.

Trouble-free performance and minimum maintenance are features of the press, because movement of the ram is controlled by the hydraulic system. There are no brake bands or clutch discs to wear or adjust. Ram guides are hardened and ground.

Standard equipment on the Di-Acro Hydra-Power Press Brake includes a back gauge which is adjustable vertically and horizontally. A micrometer type front operated back gauge is available as an accessory.

A NEW CONCEPT!

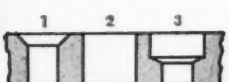
MOHAWK

Size-Optional

SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

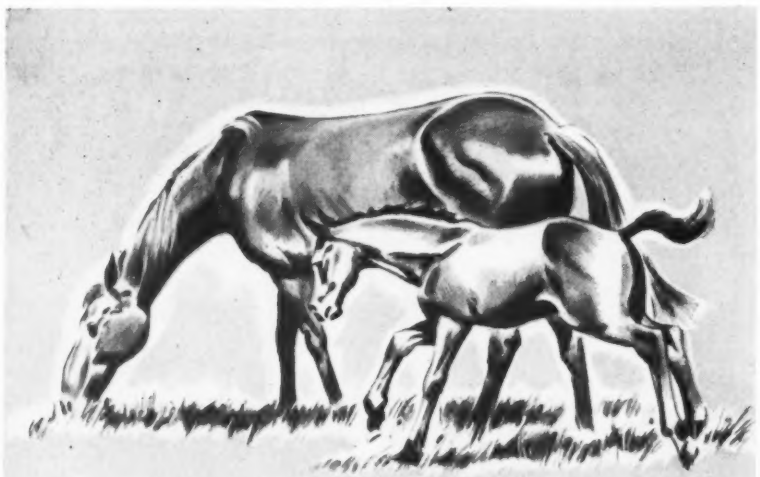
worlds largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 851

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Production Obtained with Automatic Production Heat Treating equipment manufactured by Commonwealth Industries, Inc., 5922 Commonwealth Ave., Detroit 8, Mich., allows for greatly reduced costs for heat treating and/or cadmium or zinc plating. Get details in a new brochure.
Circle Inform-A-Gram No. B1.

Spring-Tension Sockets and Swivels on the universally adjustable "Dextra-Lites" facilitate spotting light where you need it. Seventeen incandescent and fluorescent lighting units for industrial and commercial applications are illustrated in Bulletin No. 134 from Swivelier Co., Inc., 43-34 St., Brooklyn 32, N. Y.
Circle Inform-A-Gram No. B2.

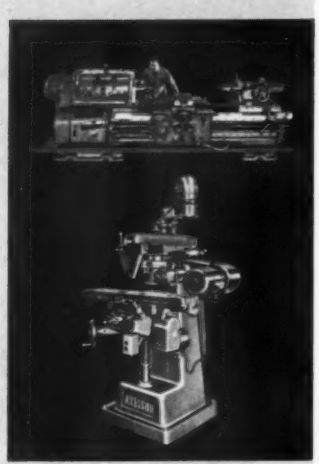


Foaling a new Champion

A new champion has been added to the Axelson family of machine tools by the purchase of the Fray Milling Machines and Milling Attachment from the Fray Machine Tool Company, Burbank, California.

Axelson will manufacture the milling machines and milling attachments with the same special skills and craftsmanship that have made Axelson Heavy Duty Lathes world famous for outstanding quality.

May we give you more information?



Axelson
Milling Machines

AXELSON MANUFACTURING COMPANY
Division of U.S. Industries, Inc.
6160 So. Boyle Avenue,
Los Angeles 58, Calif.

Authorized dealers in principal industrial centers.

CIRCLE INFORM-A-GRAM KEY NO. 861

Fastening Techniques presented in the new Air Impactool catalog show many opportunities for savings in running nuts, bolts, cap screws, and other types of fasteners with air tools. Actual case histories substantiate the claims made that Impactools answer fastening cost problems. Ask for Form 5200-A from Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., or —
Circle Inform-A-Gram No. B3.

Gang Slitters described in Circular No. 898-S-2 cover both standard and custom engineered models ranging in size from hand-operated, bench mounted slitters to fully automatic slitting lines. Three basic types are discussed: conventional driven, pull-through, and combination slitters, with cutter diameters from 3" to 16". Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Circlie Inform-A-Gram No. B4.

Good or Bad Lubrication begins in the oil room and continues along the production line. "Five Plans for Better Plant Lubrication" shows how savings can be realized from proper lubricant storage and application. Alemite equipment is also illustrated. The booklet is available from Stewart-Warner Corp., 1826 Siversey Parkway, Chicago 14, or —
Circle Inform-A-Gram No. B5.

Pneumatic-Hydraulic Actuators and Controls for industrial production machinery, including power transmission systems and components, are illustrated with schematic drawings and photos in National Pneumatic's Bulletin I.C.-2.2. These systems eliminate less satisfactory hand and mechanical transmission methods on all types of machinery with resultant increases in production, safety, and dependability. Industrial Actuators and Controls Div'n, National Pneumatic Co., Inc., 125 Armory St., Boston 19, Mass., or — **Circle Inform-A-Gram No. B6.**

Three Air Operated Production Tools — a vise, air press, and air ram — that offer a power factor of 15 times air line pressure, are illustrated and described in a 4-page bulletin from W. R. Brown Corp., 2701 N. Normandy Ave., Chicago 35, Ill. "Speedy" accessories included in the bulletin are foot control valves, air valves, hand valves, air regulators, filters, and blow guns.
Circle Inform-A-Gram No. B7.

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Cincinnati Milling's Hy Powermatic Milling Machines are heavy duty fixed bed types, specially designed for continuous operation on medium to large size parts. Design highlights, completely described in Catalog M-1871, include variable table feed rates of ¼" to 150" per min, built in backlash eliminator, automatic spindle stop, and unit-type construction. Get the catalog from The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, or —
Circle Inform-A-Gram No. B8.

Modern Rubber-Cushioned Abrasives are creating an entirely new concept of finishing metals, plastics, wood, etc. Rubber and abrasive, evenly dispersed through the compound, create a combination-action which simultaneously burrs, finishes, cleans, and polishes. A catalog from Brightboy Industrial Div'n, Weldon Roberts Rubber Co., 95 N. 13 St., Newark 7, N. J., lists the entire line of wheels and accessory products available in many sizes, of aluminum oxide or silicon carbide grains.
Circle Inform-A-Gram No. B9.

Large Diameter Workpieces such as jet turbine rotors, track carriers, and large motor armatures can be accommodated on the Landis Type CHW plain grinder, available in 30", 36", and 48" diameter swings. Complete specifications and construction notes are contained in 4-page Bulletin CB-52 from Landis Tool Co., Waynesboro, Pa., or —
Circle Inform-A-Gram No. B10.

A Greater Range of Speed and More Power, combined with a graduated pressure valve, permit a wide choice of blade speeds and pressures for maximum production and blade life with the metal cutting band saws illustrated in a recent booklet from W. F. Wells & Sons, Three Rivers, Mich. Five models are illustrated, offering variable speed drive, offset guides, graduated cutting pressure, and quick blade changes.
Cirle Inform-A-Gram No. B11.

The Versatility of a Machine Usually Used Only for Boring is illustrated in a new Job Folder available from Bryant Chucking Grinder Co., Springfield, Vt. Eleven case history reports show drilling, turning, facing, grooving, and contour turning and boring operations being performed on the Bryant 998 precision boring machine.
Circle Inform-A-Gram No. B12.

"Swivel Joints for Piping" shows uses for the Barco self-adjusting swivel joint in piping for power, process, heating, chemical, or hydraulic service. Catalog No. 265-B contains complete descriptions, dimensions, and applicational data. Barco Mfg. Co., Dept. J-40, 501 Hough St., Barrington, Ill.
Circle Inform-A-Gram No. B13.

Shafts of ⅜" to 3⅛" Diameter can be handled with Producto's self-centering shaft vise when machining keyways, slots, or splines. Design features, applications, and dimensions are included in the self-centering vise bulletin from The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn.
Circle Inform-A-Gram No. B14.

5403

do you WASTE MONEY RISK ACCIDENT doing things the HARD WAY?

Take a trip through your plant today and note how many assembly and maintenance operations are being done in awkward or tiresome positions.

Imagine THEM BEING DONE ON

PORTELVATOR

THE HANDY HAMILTON PORTABLE ELEVATING TABLE

With Portelvator hundreds of assembly and maintenance jobs are accomplished at the *right height* and in the *best light*. And that means money in the bank and workmen on the job; faster work and fewer accidents.

Portelvator prices start at $155.00— place a couple at your workmen's disposal and watch results.

Complete description in FREE Bulletin No. P-5403.

WRITE FOR IT!

Address The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio

IT'S A **Hamilton Tool**

USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 871

Ideal When Frequent Changes of Various Height Dies are necessary, the adjustable-bed punch presses manufactured by Ferracute Machine Co., Bridgeton, N. J., are fully described in catalog P-200. The presses have a standard throat and are available in 20 to 105-ton models.
Circle Inform-A-Gram No. B15.

Unbalance in Parts Weighing from a Few Ounces to several hundred pounds is quickly measured and located with Gisholt's improved Dymetric Type S balancing machines. Details for several horizontal and vertical models, as well as general construction and operational data, are included in a bulletin from Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis., or —
Circle Inform-A-Gram No. B16.

For Hole Diameters 0.030" and Up, Kellerflex carbide hole finishing burrs, in all spirals and cuts, offer longer tool life, faster production, and accuracy held to 0.0002" for size. They are the subject of Circular No. 584 from Pratt & Whitney, W. Hartford 1, Conn.
Circle Inform-A-Gram No. B17.

Sets screws 83% faster

ROTOR RIGHT ANGLE NUTSETTER speeds assembly of radio chassis

JOB: Driving #8 hex head self-tapping screws for assembly of radio chassis.

FORMERLY: Electric Nutsetter, operating at 1750 rpm. Too slow.

NOW: Rotor S-02LRA Right Angle Reversible Air Nutsetter operates at 3200 rpm, gives faster run down, handles easier.

RESULTS: 83% saving in time. Used 60% of production time, "02" Nutsetter paid for itself in about 4 weeks.

This Rotor Nutsetter lasts longer, performs better than other midget right angle tools because of an all-steel right angle head with replaceable bevel gears running in ball and needle bearings. Ask for a demonstration of "02" Series Nutsetters and Screw Drivers.

Rotor makes a complete line of portable tools

SPECIFICATIONS

Model	Free R.P.M.	Capacity Nuts	Capacity Screws	Weight (lbs.)	Lgth.	Drive
S-02LRA (Reversible)	3200 | 1600	To ¼"	To #12	2⅛	10½	¼" Sq. ⅝" Sq.
	680 | 360	⅜"	⅝"	2¼	11⅛	⅜" Sq. ¼" Female Threaded

THE ROTOR TOOL CO.
CLEVELAND, OHIO

HIGH CYCLE

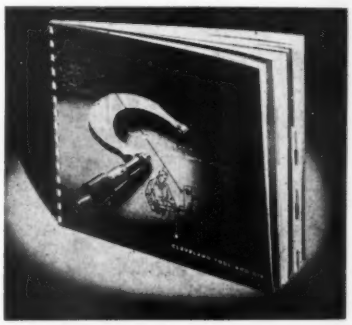
AIR

CIRCLE INFORM-A-GRAM KEY NO. 881

Interconnected Pneumatic Clutch and Brake, motorized slide adjustment with reversing starter, automatic force feed, floor line lubrication, and bronze bushed crankshaft are just a few of the standard features on Ferracute double crank straight side presses illustrated in a new bulletin from Ferracute Machine Co., Bridgeton, N. J.
Circle Inform-A-Gram No. B18.

Perform Countless Packaging Operations automatically with equipment manufactured by Pak-Rapid, Inc., 530 N. 21 St., Philadelphia 30, Pa. Illustrated are the six standard interchangeable feeding mechanisms, including a semi-automatic magazine feed for identical circular shapes; a semi-automatic tray conveyor feed for an assortment of small parts; and a turret feed for handling irregular shapes.
Circle Inform-A-Gram No. B19.

The Story of How the Precision Tooling Requirements of Industry are served is graphically presented in 32-page "Precision . . . Quality or State of Being Precise," from Cleveland Tool & Die Co., 1643 Eddy Rd., Cleveland 12. It covers the facilities



and skills available for all phases of carbide fabrication and designing and building lamination dies and compacting dies for metal and ceramic operations and custom jig grinding and boring.
Circle Inform-A-Gram No. B20.

All Types and Sizes of Gage Handles — double end reversible, single end reversible, taperlock, trilock, and spline gage handles — and gage blanks are described in a new catalog from Royal Oak Products Co., Box 161, Royal Oak, Mich.
Circle Inform-A-Gram No. B21.

Don't Discard Taps with Threads Intact—sharpen them with the Rocket tap sharpener. Eight pictures in a newly-released bulletin from Rockford Die & Tool show the Rocket in operation on any grinder.
Circle Inform-A-Gram No. B22.

Medium, Medium-High, and High Pressure Die Springs are included in the new catalog from Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. The booklet's simplified method of spring se-

lection makes it easy to choose the correct size and capacity springs for your specific operations.
Circle Inform-A-Gram No. B23.

Master Mask Makers with long experience in actual product finishing perfected the process of pressure forming masks for finish painting dials, nameplates, etc. The Finish Engineering Co. catalog shows the three main masking principles for spray painting such items and describes some of the Fin-E-Co equipment. Finish Engineering Co., Inc., 1115 Cherry St., Erie, Pa., or —
Circle Inform-A-Gram No. B24.

The Secret Behind the Accuracy of "Hilo" Set Plugs for setting thread roll gages, roll thread snap gages, etc., is their exclusive design. Two sections of the gage plug have different pitch diameters but identical lead and angles, for highest accuracy. An illustrated folder from The Pipe Machinery Co., 29100 Lakeland Blvd., Wickliffe, Ohio, describes the plugs.
Circle Inform-A-Gram No. B25.

A New Method for Producing Permanent Nomographs on abrasion-resistant anodized aluminum plates, using conventional photographic techniques, is detailed in literature now available from Metalphoto Corp., 2903 E. 79 St., Cleveland 4, Ohio. Distinct pencilled lines and computations can be made right on the plates, then erased without disturbing the permanent scales.
Circle Inform-A-Gram No. B26.

The Wide Range of Standard Dies for production bending of sheet metal and steel plate on press brakes of any make is comprehensively described in Bulletin No. D-4-55 from Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36. The complete range of standard "Chicago" induction hardened press brake dies is included.
Circle Inform-A-Gram No. B27.

Twenty-Two Questions and Answers on Magnetic-Particle Testing are clearly presented in a booklet published by Research & Control Instruments Div'n, North American Philips Co., Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y. Procedure and problems are discussed, along with notes on prod and coil techniques, current and voltage conditions, effects of scale, and portable field work.
Circle Inform-A-Gram No. B28.

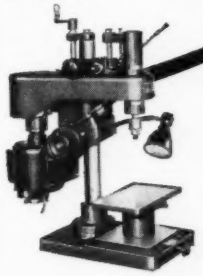
Ceramic Molds Are Utilized in the "Ceramicast" process to produce castings with the advantages of smooth surfaces, close tolerances, and reduced machining costs and the possibility of casting intricate shapes and thin metal sections. Read all about it in a bulletin from Lebanon Steel Foundry, 161 Lehman St., Lebanon, Pa.
Circle Inform-A-Gram No. B29.

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 1/4" in all drillable materials) is super sensitive. Provides speeds, infinitely variable, between 840 R.P.M. and 9300 R.P.M. Is built to precision tolerances, and with the stamina to retain precision.

Get prices and specifications without obligation
ASK FOR FREE BULLETIN 5408

Address The Hamilton Tool Company
832 South Ninth Street
Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 891

The "Constant Diameter" Kodiak Grinding Tools with interchangeable abrasive wheel segments replace conventional grinding wheels. They permit adjustment of wheel segments to obtain optimum surface speeds or to compensate for wheel wear and redressing. A descriptive brochure is available from Continental Products, Inc., Dep't 1C, 872 E. 140 St., Cleveland 10, Ohio, or —
Circle Inform-A-Gram No. B30.

Designed Especially to Handle Today's Tough Alloys faster and more economically, Potter & Johnston's Model 4-U automatic turret lathe features an extra-large dog drum, all-clutch drive, and independent front and rear cross slides. Complete specifications are in Bulletin No. 153-1 from Potter & Johnston Co., Pawtucket, R. I., or —
Circle Inform-A-Gram No. B31.

Notch Both Sides of tubing or pipe for making perfect "T" joints for welding or brazing, with one stroke of the press ram, when you use a Twin-Notch Arc-Fit tube and pipe notching tool. No extra finishing is required nor is there any deformation of the pipe or tube. An illustrated bulletin from Vogel Tool & Die Corp., 1825 N. 32 St., Melrose Park, Ill., shows various notching units and explains their operation and results.
Circle Inform-A-Gram No. B32.

The "Bonded to the Surface" Solid Film Lubrication process is extremely versatile, especially where conventional lubricants are not applicable. It lubricates at exceptionally high or low temperatures, is ideal for high loads and speeds, and doesn't pick up lint, dust, or dirt. Get a technical file folder on it from Electrofilm, Inc., Box 106, N. Hollywood, Calif., or —
Circle Inform-A-Gram No. B33.

A New Kind of Tubing Performance is achieved with "Nylaflow" nylon tubing. It flexes without fatigue, won't corrode, is extremely tough, and serves over a wide temperature range. Uses for "Nylaflow" include air, process, fuel, oil, coolant, hydraulic, and lubricant lines. Get details in a booklet from The Polymer Corp. of Penna., Reading, Pa.
Circle Inform-A-Gram No. B34.

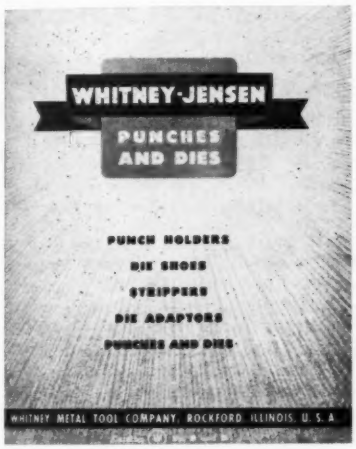
The "Weightless" Cutting Action of Tapmatic tapping attachments accounts for the units' consistent accuracy in ferrous and non-ferrous metals, including the softer alloys. A bulletin from Tapmatic Corp., Costa Mesa, Calif., explains the operation of Tapmatics for non-reversible spindles and Tapmaster units for reversible spindle machines.
Circle Inform-A-Gram No. B35.

An Entirely New Approach to air line lubrication is introduced in the "Airliner" air line lubricator, which atomizes the oil in a chamber remote from the air line so only oil mist is injected into the air stream. This provides more consistent lubrication. Get illustrated details in a bulletin from Gits Bros. Mfg. Co., 1866 S. Kilbourn Ave., Chicago 23, Ill., or —
Circle Inform-A-Gram No. B36.

Get these EXTRAS at
NO extra cost with....
3P
1. IMMEDIATE DELIVERY
2. GREATER ECONOMY
3. COMPLETE INTERCHANGEABILITY
Because Porter's ONLY business is producing Punches and Die Buttons—You always get QUALITY products at substantial savings.
And now—PORTER introduces Interchangeable
BAL-LOK*
* REG.
No need to change your present Standard Retainers . . . No need to change your present tooling design.
3-P BAL-LOK Punches and Die Buttons are made from High 1.50% Carbon and High Speed Steels . . . Precision ground to the highest quality found on any commercial punch!
BOOST YOUR PROFITS WITH 3-P
Over 37,000 Standard Sizes STOCKED FOR IMMEDIATE DELIVERY. Avoid costly down-time.
Write for complete details, today.
"Still the best performer"
PORTER PRECISION PRODUCTS
PRinceton 6338 P.O. Box 208 Cincinnati 15, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 901

A Machine That Actually Prints and fully develops whiteprints at speeds up to 70' per min, has been introduced by C. F. Pease. The extremely fast printing speed is obtained by use of an inexpensive 5000-watt printing lamp. The "Century" automatic whiteprinting machine's features are in a bulletin from The C. F. Pease Co., 3810 N. Rockwell Ave., Chicago 18, Ill.
Circle Inform-A-Gram No. B37.

Standardized Punches and Dies for hand and power punches, punch presses, power presses, and special production machines are fully described in a new 16-page "Punch and Die Catalog" from Whitney Metal Tool Co., 702 Forbes St., Rockford, Ill. All tools up to 1" round holes and



11/16" square holes are covered and 16 standardized sets for punching fluorescent fixture starter holes, electrical outlet knockouts, and key holes, etc., are included.
Circle Inform-A-Gram No. B38.

Exclusive Features of the Improved Model 16 New Britain six-spindle chucking machine include preloaded ball bearing spindle mountings, automatic spindle carrier clamping device, and open end construction. Get all the facts in a bulletin from New Britain-Gridley Machine Div'n, The New Britain Machine Co., New Britain, Conn.
Circle Inform-A-Gram No. B39.

The New Air-Cooled 20-hp Compressor developed by Ingersoll-Rand brings to the small compressor field the operating efficiency, economy, and dependability of the I-R Channel Valve which has proven its worth in compressors of up to 4000-hp. Cutaway views and specification tables are in a bulletin, Form 1540, from Ingersoll-Rand Co., 11 Broadway, New York 4, or —
Circle Inform-A-Gram No. B40.

You Can Save on Production Tube Cutting with the new Vogel tube cut-off machine introduced in a bulletin from Vogel Tool & Die Corp., 1835 N. 32 Ave., Melrose Park, Ill. The machine cuts tubing in less than 1/3 sec. per cut, assures length accuracy to 0.004", and has interchangeable dies.
Circle Inform-A-Gram No. B41.

Numerous Tables Giving Size Range and Straightened Lengths of Rezistal stainless steel, coil data, chemical analysis and characteristics, physical properties in the annealed condition, and mechanical properties for cold drawn wire are featured in 32-page "Rezistal Stainless Steel Wire" manual from Crucible Steel Co. of America, Box 88, Pittsburgh 30, Pa. **Inform-A-Gram No. B42.**

Quad-Rings, Newly Developed Hydraulic Seals — their composition, specifications, applications, and advantages — are discussed in a 10-page folder recently issued by Minnesota Rubber & Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minn.
Circle Inform-A-Gram No. B43.

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "Independent selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

CONTRIBUTES to more gear precision with no sacrifice of gear production,

OR INCREASED gear production with no sacrifice of gear precision, ... OR BOTH!

Prices and specifications without obligation

ASK FOR FREE BULLETIN 5410
Address
The Hamilton Tool Company
832 South Ninth Street
Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 911

Designed for Use on Production Machines where oil or coolant would prevent the use of standard limit switches, Allen-Bradley (Bulletin 802T) Oiltight Limit Switches have eight interchangeable heads and are compact, rugged, and easily mounted. A bulletin from Allen-Bradley, Milwaukee 4, Wis., shows the switches, their uses, and methods of application.
Circle Inform-A-Gram No. B44.

A Chart Service for optical comparators, with cost figures for several typical cases, are described in a newly released brochure from Vanguard Instrument Corp., 184 Casper St., Valley Stream, N. Y. Also covered are direct-view overlays for casting inspections, all prepared by Vanguard.
Circle Inform-A-Gram No. B45.

The Adjustable Chasers on the new Modern MS solid adjustable taps can be removed from the tap body, reground, and reset to cut to the original size for economy and accuracy. Two types of chasers are now available: regular, for through holes; and OH overhanging, for blind holes and shoulders. For details, get Bulletin M-130 from Modern Tool Works, Div'n of Consolidated Machine Tool Corp., Rochester 10, N. Y., or —
Circle Inform-A-Gram No. B46.

The Reciprocating Booster Continues To Supply High Pressure Oil or water to hydraulic work cylinders until full pressure is built up in the cylinders. The new pamphlet illustrating the Miller double-acting reciprocating boosters features drawings of a basic circuit and rapid pressure and slow pressure build-up circuits, and mounting data. Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.
Circle Inform-A-Gram No. B47.

More Than 70 Different Types of Automatic Dieing machines and power presses produced by Emhart's four divisions — Henry & Wright, The V & O Press Co., Hartford-Empire Co., and Standard Knapp — are included in the big new catalog from Emhart Mfg. Co., Hartford 2, Conn. Over 275 machines are described.
Circle Inform-A-Gram No. B48.

"Automatic Electrolytic Shaping With Electronic Control" explains in detail how standard grinders equipped with Anocut electronic control and using Anocut electrolytic salts have increased metal removal efficiency — up to six times that of conventional grinders. Get your copy from Anocut Engineering Co., 631 W. Washington St., Chicago 6, Ill., or —
Circle Inform-A-Gram No. B49.

Ideal for Handling Air, Gas, Water, and other low viscosity fluids, tight sealing Bulletin 8030A solenoid valves are particularly useful as controls on gas fired ovens and furnaces, automatic dispensing units, vacuum holding applications, and similar type units. For a complete description with flow charts and diagrams, ask for Bulletin 743 from Automatic Switch Co., 391 Lakeside Ave., Orange, N. J., or —
Circle Inform-A-Gram No. B50.

Metal Fabricators Can Do Away With at Least Four Slow and Costly manufacturing steps by taking advantage of the pre-finished metals. Nickeloid's "Mar-Not" protective covering on the metals preserves lustrous finish during severe drawing and forming operations and peels off after final assembly. Uses for the pre-finished metals covered in American Nickeloid's brochure are innumerable. Get fabrication notes plus descriptive information in the booklet from American Nickeloid Co., Peru, Ill., or —
Circle Inform-A-Gram No. B51.

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haskAIR Grinder...

most powerful air turbine grinder in its class!

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(1/5 H.P. prony brake test)

- **Permanently sealed bearings . . . never needs lubrication in air lines or grinder.**
- **Removable nose piece for deep grinding.**
- **Gyro action of turbine holds tool steady.**

Here's power—SUSTAINED POWER —like you've never experienced before in an air grinder . . . power unexceeded by any other air grinder in the same price range . . . **maintains its high-speed efficiency under load!** Built with a lightweight, contoured, hand-fitting aluminum housing, the Haskins **haskAIR** Grinder handles easily, balances perfectly . . . excellent for the most precise grinding job. Complete kit includes: carrying case, adapter hose, mounted points, dressing stone and wrenches.

for Complete details

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haskins

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605 S. Washtenaw
Chicago 12, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 921

The Do-It-Yourself Trend Has Hit the Metalworking Industry with the "doit urslf" precision tool kits. Parts for a toolmaker's vise, magnetic parallels, magnetic V blocks, sine blocks, flat plate inspection blocks, and V block and clamp set are shown, along with the illustrations of the finished product, in a catalog from S. J. Williams Precision Tool Kits, Inc., 4448 Soo Line Lane, Schiller Park, Ill.
Circle Inform-A-Gram No. B52.

Four Selective Gaging Ranges on Reliant electric comparators take the place of four ordinary comparators; you merely flip a switch to select the desired range. All the features of these instruments are included in illustrated Catalog 55H from Reliant Gage & Supply Co., 4969 Firestone Blvd., South Gate, Calif. **Inform-A-Gram No. B53.**

A Hopper-Fed Mechanism That Automatically Feeds second operation parts into Brown & Sharpe automatic screw machines, is announced in a new Hi-Shear booklet. "Auto-Load" makes it possible and practical to automatically feed, locate, machine, and eject a wide variety of headed parts with the same precision as bar stock. Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif., or —
Circle Inform-A-Gram No. B54.

"Automation Through Varitrol Control" shows how an improved pneumatic control has been designed into U. S. Varidrive motors to increase and/or improve output of a customer's product, reduce waste, save time and manpower. With it,

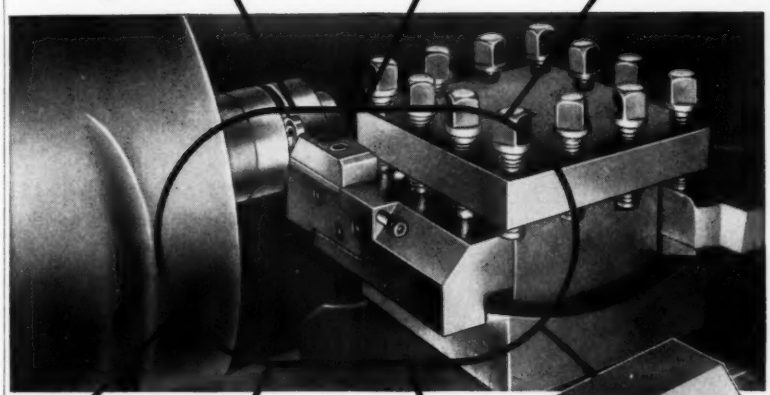
Varidrive speed can be controlled automatically by pressure, temperature, humidity, viscosity, flow rate, tension, etc. Get a copy of the interesting booklet from U. S. Electrical Motors Inc., Box 2058, Los Angeles 54, Calif., or —
Circle Inform-A-Gram No. B55.

A-P Solenoid Valves are designed for use with liquids or gases for stop and start operations, mixing and blending, metering and measuring, and controlling pressure, amount, and flow. Information on their selection, construction, lift ratings, and other features are in a bulletin from A-P Corp., 2450 N. 32 St. Milwaukee, Wis.
Circle Inform-A-Gram No. B56.

Drawn Aluminum Boxes, all available without tooling charges, are listed in the 21-page Zero catalog. Zero boxes are widely used by manufacturers of electrical, electronic, and similar instruments as cases and housings, and smaller sizes are used on the instruments themselves. Zero Mfg. Co., Box 509E, Burbank, Calif.
Circle Inform-A-Gram No. B57.

High Speed Steel Blue Helix Reamers are heat treated and then subjected to Pratt & Whitney's special surface hardening treatment. As a result, they cut longer, hold their accuracy, and resist chip abrasion better. Get details on sizes in Circular No. 563 from Pratt & Whitney, W. Hartford 1, Conn., or —
Circle Inform-A-Gram No. B58.

NOW YOU CAN CUT-OFF WITH CARBIDE
AT *full* RATED CUTTING SPEED



The days of cutting machine speed down when doing cut-off work are gone forever . . . gone for those who own a carbide "Manchester" cut-off tool. Reports from all over the country show tremendous savings in production time. Tools are available for turret lathes, automatics, cut-off machines and engine lathes. Complete literature is available . . . without obligation

Representatives in principal cities

PDQ **PORTAGE Double-Quick TOOL CO.**
1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 931

Higher Production Schedules in the Pressroom can be met by proper automatic feeding. Surefeed automatic hitch feed units are mounted on the die set so the two units are handled as one. Design features, instructions for setup procedure, and specifications on the Surefeed are in a bulletin from The Producto Machine Co., Bridgeport, Conn.
Circle Inform-A-Gram No. B59.

For Every "Small-Work" Job of Grinding and Finishing, small flexible shaft machines and accessories are of great value. Foredom's pencil-size handpieces feature finger-tip control and enable operators to finish even the tiniest of molds, castings, forgings, etc. Catalog No. 200 from Foredom Electric Co., 27 Park Pl., New York 7, has complete information.
Circle Inform-A-Gram No. B60.

Do Away With Costly Carbide Wastage almost completely by cutting broken or damaged tools and standard blanks with Union Wire Die's carbide cutting machine. The unit is like a hacksaw to carbide users; it cuts the carbide and thus saves time-consuming, expensive carbide grinding. Get details in a folder from Union Wire Die Co., 71 W. 45 St., New York 36., or —
Circle Inform-A-Gram No. B61.

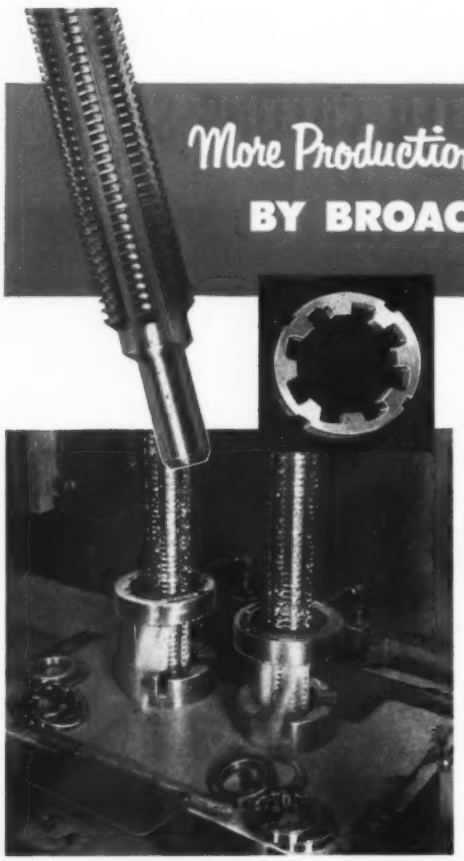
The 36-Speed High Power Headstock on LeBlond's heavy duty 25" engine lathe is newly-designed from the ground up to deliver effectively all of its 50-hp. An exclusive feature is its adjustable acceleration for starting, stopping, and jogging. These and other improvements are featured in bulletin HD-155 from The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.
Circle Inform-A-Gram No. B62.

The Revised Edition of "Armco Magnetic Ingot Iron for D-C Applications" covers a wide range of subjects including magnetic core uses; mechanical, physical, and magnetic properties; machining; drawing; and welding. Diverse applications — from telephone wire and small replay parts to huge magnetic cores for cyclotrons — are shown. Armco Steel Corp., Middletown, Ohio.
Circle Inform-A-Gram No. B63.

Work Samples Indicate the application of Waterbury Farrel Series "E" single acting, open back, power bench presses to closing, riveting, light blanking, stamping, and piercing operations in Circular No. 779M-4. Complete dimensional data for low pattern and high pattern machines is given in the 12-page booklet. Waterbury Farrel Foundry will supply copies of the circular, or—
Circle Inform-A-Gram No. B64.

The Miniature Constant Velocity Universal Joint, the Rzeppa "OV", is designed for applications which demand compactness and ruggedness. It provides uniform turning of a shaft without speed fluctuations. Descriptions, drawings, and engineering data on the Rzeppa "OV" is contained in a new bulletin from The Gear Grinding Machine Co., Joint Div'n, 3901 Christopher, Detroit 11, Mich.
Circle Inform-A-Gram No. B65.

Eleven Different Types of Vibration Isolating Units are presented in Korfund's Bulletin K4A. Installation photos show their versatile applications and a special selector chart shows recommended and alternate methods of isolating equipment ranging from business machines to giant punch presses. Get the vibration control mounting bulletin from The Korfund Co., Inc., 48-39E 32 Pl., Long Island City 1, N. Y., or —
Circle Inform-A-Gram No. B66.



More Production, More Profit
BY BROACHING . . .

REMOVE STOCK TO PRECISION LIMITS—FAST . . . ROUGH AND FINISH IN ONE PASS!

The scope of Broaching has broadened in recent years. Many broaching operations do precision work in far less time than other metal-cutting methods.

Continental Engineers have for years been designing all types of cutting tools and broaches. They can recommend without bias your most economical way to do the work.

For facts about increasing your production by broaching, call in your local Ex-Cell-O representative —or write Continental in Detroit for Cutting Tool Catalog.

Internal broaching of a cam ring. Note the complexity of the ring design. The steel is soft and tends to tear, yet this Continental Brooch sizes the I.D and cuts 8 splines 5/16" deep *in one pass.*

CTW

Continental TOOL WORKS DIVISION OF EX-CELL-O CORPORATION DETROIT 32, MICH.

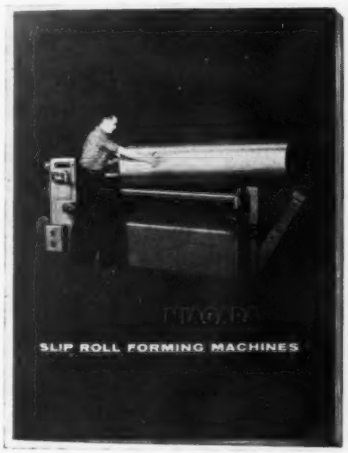
84-39

CIRCLE INFORM-A-GRAM KEY NO. 941

You Can Save Time and Labor and Speed Setups by using standardized component parts for jigs, fixtures, and dies wherever possible. Vlier tooling specialties — torque thumb screws, spring plungers, screw-ball clamps, fixture keys, spring stops, and toggle pads — are illustrated and described in Catalog No. 55 from Vlier Engineering Inc., 8900 Santa Monica Blvd., Los Angeles 46, Calif., or —
Circle Inform-A-Gram No. B67.

A Rapid "Plunge Cut" Shaving Cycle can be used on the new Model GCE-12" internal rotary gear shaving machine, in addition to conventional shaving. A typical operating cycle write-up helps describe the precision machine in a new bulletin from the manufacturer, National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.
Circle Inform-A-Gram No. B68.

The Complete Line of Power and Hand Operated Slip Roll Forming machines manufactured by Niagara are presented in Bulletin 77D. The new publication also shows how the



company's pinch type rolls assure production of commercially true cylinders virtually free from flat spots. Get a copy from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y., or —
Circle Inform-A-Gram No. B69.

Eliminate Mutilation and Stretching of Stud Threads and distortion of cotter key holes with the "Target" hex collet stud driver, which drives studs by pitch diameter pressure instead of pressure on the top of the stud. "Target" drivers are especially designed and engineered for the precision engine industry. Construction details are in a bulletin from Titan Tool Co., Main St., Fairview, Pa., or —
Circle Inform-A-Gram No. B70.

Designed to Take Many Years of Hard Usage, the heavy duty 6" machine vise described in the Producto Bulletin TE-2-104, has specially hardened and ground guide rails and jaw plates to prevent destruction by milling or drilling into jaws or body. Get detailed information from The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn., or —
Circle Inform-A-Gram No. B71.

A New Carbide Grade, K11, that provides exceptionally high resistance to abrasion is introduced in Kennametal's Catalog No. 55. The company's complete product line of carbide tooling, blanks, and inserts is covered and its latest general purpose steel-cutting grade, K21, is detailed. Kennametal Inc., Latrobe, Pa. **Circle Inform-A-Gram No. B72.**

The Only Bench Shaper with Circulating Force Feed Lubrication, the South Bend 7" precision shaper, is fully described and illustrated in Shaper Catalog 5417. The unit answers many toolroom and production problems with its accuracy and versatility in rapidly machining small parts. South Bend Lathe Works, South Bend 22, Ind.
Circle Inform-A-Gram No. B73.

THIS ONE WAS EASY . . .
A Nilson 4-Slide, Number 1, forms 150 drapery hooks per minute from 0.70 basic steel wire. Nilson 4-Slides form wire or ribbon stock from the coil. They straighten, feed, pierce, blank, swage, stamp or coin, cut and form in one, fast, automatic operation . . . accommodate wire up to .5" dia., in feeds to 32" max., and ribbon up to 3.5" wide. Press sections from 5 to 75 tons. Send for catalog.

NILSON 4-SLIDE TAKES A TOUGH ONE

Mass production of body trim clips for a leading make automobile proved a complex forming problem. A. H. Nilson's 4-Slide (Model S-4-T) did the job, forming .025" x 3", 1065 C.R.A. steel at 54 strokes per minutel Accurate, fast, and automatic, Nilson 4-Slides keep pace with one of the nation's biggest industries.

A.H. NILSON MACHINE COMPANY

1522 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines : Staple Forming Machines : Wire Straightening Equipment
Wire and Stock Reels : Side Feeds for Presses : Wire & Ribbon Stock Forming Machines

CIRCLE INFORM-A-GRAM KEY NO. 951

The Tooling Balls and accessories described in Reliant's Catalog 55G are used for measuring critical surfaces, angles, parts, or holes. Applications in the jig shop, tool room, and for inspection are listed in the illustrated booklet. Reliant Industries, 4947 Firestone Blvd., South Gate, Calif.
Circle Inform-A-Gram No. B74.

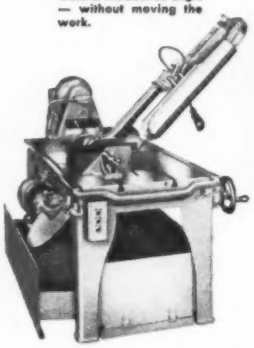
The 7" by 12½" Magnetizing Surface of the "Battery Operated" lift magnet provides deep penetration and a high lifting capacity of 2,000-lbs. It is operated by a common 6-volt wet cell battery and length of haul is not restricted by cords or wires. Detailed information is included in a new bulletin from Sundstrand Magnetic Products Co., Rockford, Ill.
Circle Inform-A-Gram No. B75.

Small Hydraulic Production Presses — Elmes Hydrolairs — powered solely by compressed air, are completely illustrated and described in Bulletin No. 1036-B from Elmes Engineering Div'n, American Steel Foundries, Cincinnati 29, Ohio. Among the uses listed are plastics and rubber molding, assembly forcing, laminating, and compacting.
Circle Inform-A-Gram No. B76.

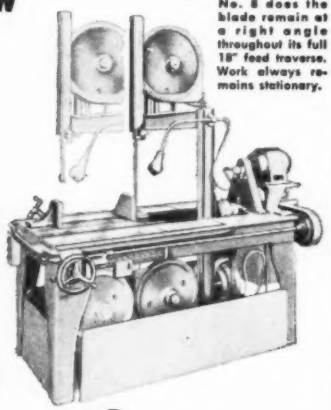
Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.



Only a No. 8 MARVEL can do all of these things: Snip-off a ½" rod or cut-off an 18" x 18" cross section.

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams

Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 961

Locate Centers or Other Predeterminated Points regardless of the shape or varying sizes of the parts with the air powered "Centr-Finder" vise made by Black. Operational diagrams and application photos help describe the precision machining vise, with working range from 0 to 4", in a bulletin from Black Drill Co., 1400 E. 222 St., Cleveland 17.
Circle Inform-A-Gram No. B77.

The Use of Phenolics in Plastic Tooling is featured in the new R-72S Phenolic Toolplastik brochure from Rezolin. In addition to covering properties, characteristics, and handling instructions, the informative brochure contains a Flow Chart demonstrating Toolplastik fabrication procedure and eleven application photos. Rezolin, Inc., 5736 W. 96 St., Los Angeles 45, Calif.
Circle Inform-A-Gram No. B78.

The Size of the Workpiece itself controls the machining process automatically with the drift-free, wear-free electro-autosizing gage. By changing the mounting methods, the electronic device can be used for a wide variety of applications, as shown in a new booklet, "Electro-Autosizing — Key to Automation," from Industrial Gauges Corp., Englewood, N. J.
Circle Inform-A-Gram No. B79.

Fully Jeweled, Anti-Magnetic "Em-re" Dial Indicators are featured in 4-page Bulletin 445 from the manufacturer, Petz-Emery Inc., Pleasant Valley, N. Y. The units give accurate, repeated readings in applications from severe production inspection lines to careful laboratory use. Special photos show important construction details in Bulletin 445.
Circle Inform-A-Gram No. B80.

The Unique "Build-Up" Round Gage Block Set, designed to save time in gaging large dimensions, is described in the new Ellstrom Standards catalog along with 28 standard gage block sets ranging from 8 to 92 pieces. Standard sets are presented in single-page tabular form to save time and eliminate confusion in comparing the sets. Ellstrom Standards Div'n, Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Circle Inform-A-Gram No. B81.

"Revitalizing Older Presses Through Press Rebuilding," just released by E. W. Bliss, presents a step-by-step rebuilding program to explain the specialized rebuilding facilities and techniques developed by the company. These include a corps of engineers, complete records on every Bliss press manufactured or rebuilt in the last 50 years, and a stockpile of replacement parts. Ask for Bulletin 47, E. W. Bliss Co., Canton, Ohio.
Circle Inform-A-Gram No. B82.

ARROW TOOL & REAMER CO. • Established 1916

Arrow means a complete LINE OF END MILLS

THIS IS Arrow's 3 FLUTE END MILL

Manufacturing skill and tool making experience for over 37 years — adds up to preference for Arrow End Mills.

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CIRCLE INFORM-A-GRAM KEY NO. 971

Ren•ite PLASTIC TOOLING NEEDED TO COMPETE TODAY

Take the case of this automotive body with Master Keller Models in cubed position

TOOLING TIME CUT AS HIGH AS 70%

A definite proof of Ren-ite Plastic Tooling doing a job better. This builder of fine cars accepted the challenge of higher production at lower production costs. Savings in tooling costs plus faster checking operations have helped to hold the price line on this 1955 car.

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Ren-ite is the dimensionally-stable tooling plastic of Thermosetting Resin used as a laminating or casting plastic without application of heat or pressure. For Keller models . . . duplicators . . . spotting racks . . . draw dies . . . drop hammer dies . . . core boxes . . . drill fixtures and new ones are being developed each day.

FREE ENGINEERING SERVICE
NO CONTRACT REQUIRED

Ren•ite PLASTICS, INC.

3179 South Cedar Road, Lansing 4, Michigan

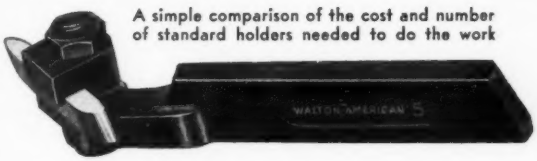
Offices in Chicago, Cleveland, Detroit, Los Angeles, New York and St. Louis

CIRCLE INFORM-A-GRAM KEY NO. 972

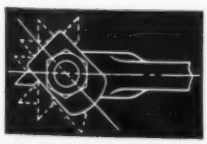
Walton-American

THE ONE "MULTI-POSITION" TOOL HOLDER REPLACING MANY!

A simple comparison of the cost and number of standard holders needed to do the work



of ONE Walton-American will quickly show you that this versatile Tool Holder is a money saver as well as a labor saver. The capacities of only four sizes range from 1/8" to 7/16".



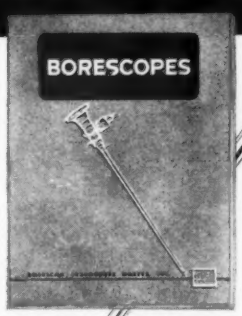
The exclusive design of the Walton-American swivel head holds the tool in any position, giving perfect grip on round or square tool bits or boring bars. Illustration shows eight most commonly used positions.

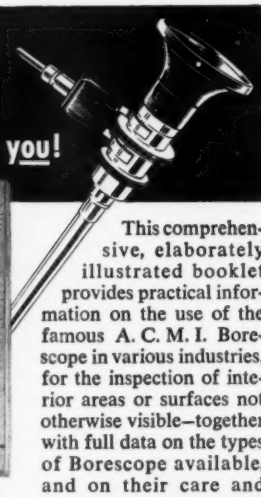
If you are seeking ways to reduce your tool costs, it will pay you to investigate Walton-American. Write for Data Folder No. 38. We offer a liberal FREE TRIAL.

The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 973

INSPECTION PROBLEMS?
This booklet is for you!





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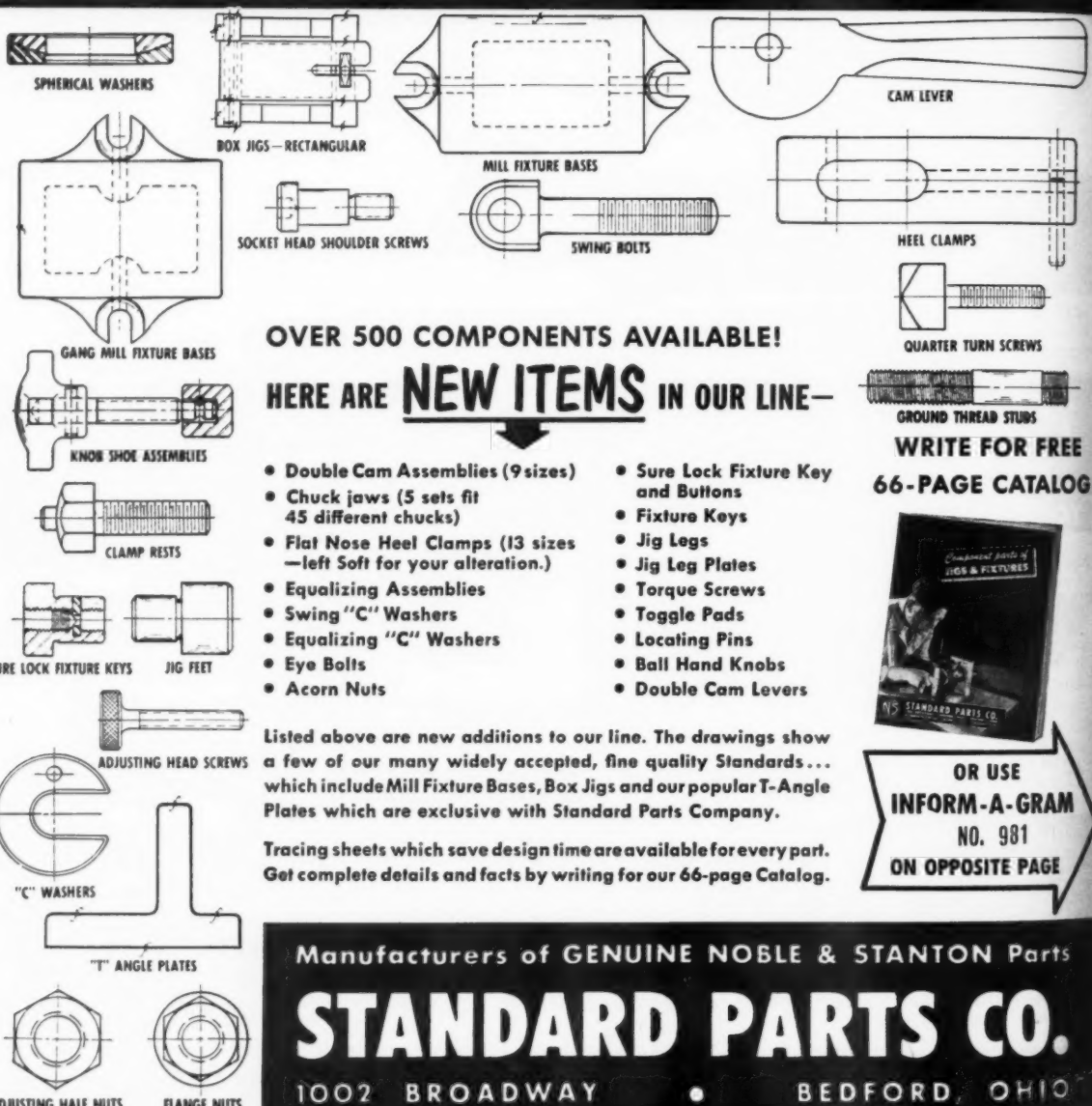

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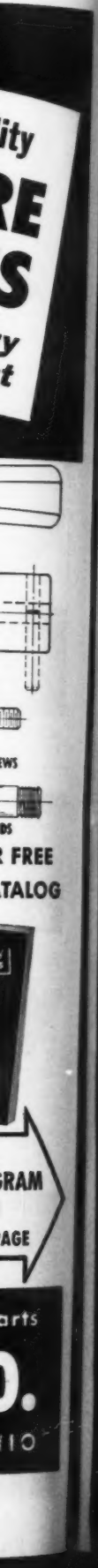
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4	22	39	771	911	1051	1152	1211	1262	1304	1382	1435	1482
5	23	40	781	921	1061	1161	1212	1263	1311	1391	1436	1483
6	24	41	801	931	1071	1162	1213	1264	1312	1392	1441	1491
7	25	42	802	941	1081	1163	1214	1271	1331	1401	1442	1511
8	26	43	811	951	1091	1164	1221	1272	1341	1402	1443	1521
9	27	45	812	961	1121	1171	1222	1281	1342	1403	1444	
10	28	46	813	971	1122	1172	1223	1282	1343	1404	1445	
11	29	48	821	972	1123	1173	1231	1283	1351	1411	1451	
12	30	49	822	973	1124	1181	1232	1284	1352	1412	1452	
13	31	50	831	974	1131	1182	1241	1285	1361	1413	1453	
14	32	671	841	981	1132	1183	1242	1291	1362	1421	1461	
15	33	691	851	991	1133	1184	1251	1292	1363	1422	1462	
16	34	701	861	1001	1141	1191	1252	1293	1371	1423	1471	
17	35	711	871	1011	1142	1192	1253	1294	1372	1431	1472	

EDITORIAL ITEMS

A1	A18	A35	A52	B16	B33	B50	B67	C2
A2	A19	A36	A53	B17	B34	B51	B68	C3
A3	A20	A37	B1	B18	B35	B52	B69	C4
A4	A21	A38	B2	B19	B36	B53	B70	C5
A5	A22	A39	B3	B20	B37	B54	B71	C6
A6	A23	A40	B4	B21	B38	B55	B72	C7
A7	A24	A41	B5	B22	B39	B56	B73	C8
A8	A25	A42	B6	B23	B40	B57	B74	D1
A9	A26	A43	B7	B24	B41	B58	B75	D2
A10	A27	A44	B8	B25	B42	B59	B76	
A11	A28	A45	B9	B26	B43	B60	B77	
A12	A29	A46	B10	B27	B44	B61	B78	
A13	A30	A47	B11	B28	B45	B62	B79	
A14	A31	A48	B12	B29	B46	B63	B80	
A15	A32	A49	B13	B30	B47	B64	B81	
A16	A33	A50	B14	B31	B48	B65	B82	
A17	A34	A51	B15	B32	B49	B66	C1	

Which article in this issue was of most interest to you? _____

_____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A5	A22	A39	B3	B20	B37	B54	B71	C6
A6	A23	A40	B4	B21	B38	B55	B72	C7
A7	A24	A41	B5	B22	B39	B56	B73	C8
A8	A25	A42	B6	B23	B40	B57	B74	D1
A9	A26	A43	B7	B24	B41	B58	B75	D2
A10	A27	A44	B8	B25	B42	B59	B76	
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A13	A30	A47	B11	B28	B45	B62	B79	
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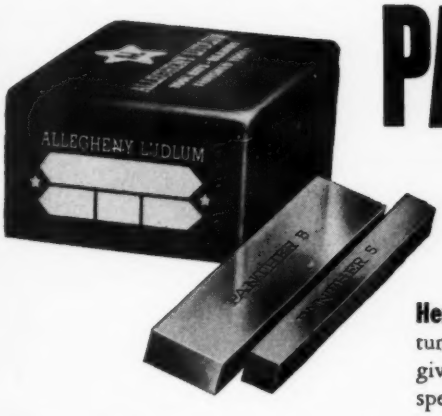

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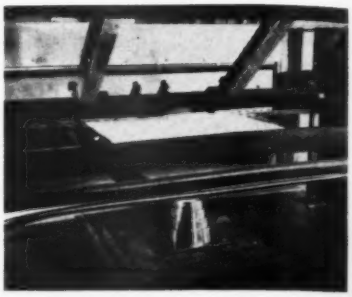
CIRCLE INFORM-A-GRAM KEY NO. 991

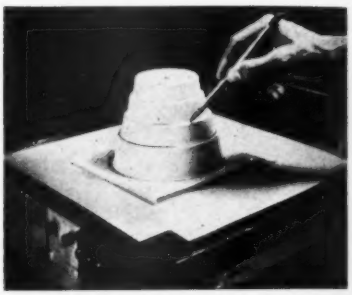
A Deep Draw Vacuum Drawing Rigid Vinyl Sheet

A calendered rigid vinyl sheet that makes possible deep-drawn vacuum formed parts at a saving in fabricating costs has been developed by Bakelite Company, a Division of Union Carbide and Carbon Corporation. By a recently improved process, a low cost rigid sheet is produced for the first time in thicknesses up to .040", in widths up to 51½", and in continuous or custom-cut lengths.

The new technique makes it possible to calender rigid sheet with a surface comparable to that of a press-matted product costing considerably more, and its greatly improved light stability makes the new rigid sheet a preferred material for new types of lighting fixtures. Current tests show no change in light transmission values, color, or other significant properties of the new rigid sheet after 15,000 hrs of continuous exposure to fluorescent light. It does not support combustion.



The new calendered rigid sheet facilitates production, for example, decorated parts 6" deep, with steeply terraced sides, drawn on conventional vacuum forming equipment by Auto-Vac Company. A plain white Bakelite rigid sheet is first placed over the mold. Softened by heat, it is drawn skin-tight against the mold by creating a vacuum between it and the sheet.

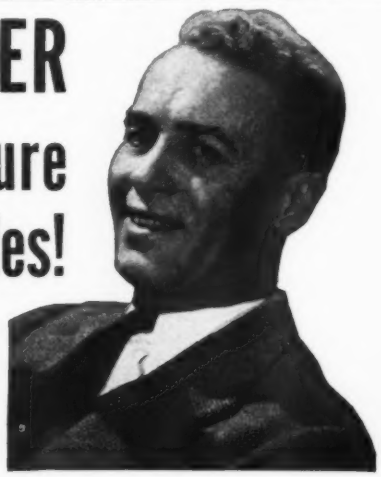


Guide lines for decorations are then drawn on the formed sheet with a pencil.

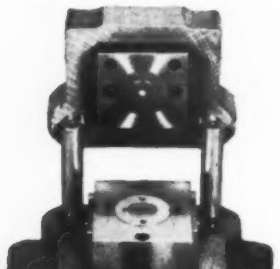
For fabricator and designer, the range of possible applications is greatly extended by calendered sheet thicknesses from .005" to .040" obtained through technical improvements developed by Bakelite. Sheet characteristics ideal for products such as deep-drawn can liners, as well as for vacuum forming of three-dimensional advertising displays, are offered in the new sheet. It is now possible to screen, print and otherwise predecorate the flat sheet with excellent register and without distortion when the piece is vacuum formed. Complex shapes have been formed with as little as eight seconds preheat time, using relatively inexpensive equipment.

Because of its high tensile and flexural strengths, this new

"HOVIS WASHER DIES have sure solved our troubles!



"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



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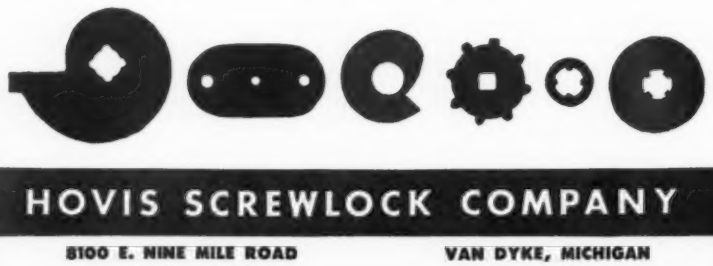

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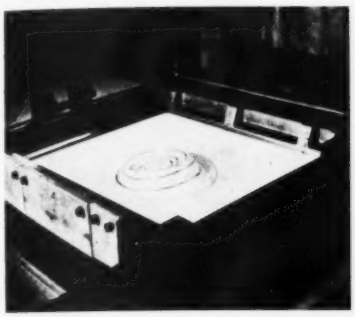
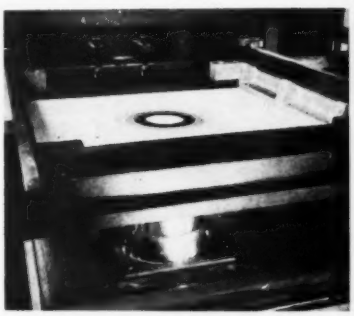
sheet resists wear and rough handling and by adding its resistance to water and most chemicals, and its resistance to wide variations in temperature and humidity, the practical uses of the new rigid sheet are greatly increased. The outstanding resistance to changes in size or shape meets high standards of engineering accuracy for precision instruments used in drafting, navigation and calculating.



When withdrawn from the forming mold and re-softened by heat, the vinyl sheet has the unique ability to recover its original flatness.



Following the lines, the desired color and designs are applied. The decorated sheet then serves as a master for decorating flat sheets of new material which are then formed without damage to the decorations.

Nozzle Plate Holes Inspected Simultaneously

A "Multi-Dimensionair" air gage employing simultaneous gaging for a series of holes has been introduced by Federal Products Corp., 5232 Eddy St., Providence, R. I.

The illustrated gage inspects four holes in a nozzle plate, measuring the diameter of each hole and checking them for roundness. After the piece is placed on the platen and the air plugs fitted into each hole the four Dimensionair dials are read to determine the hole diameters. If they are all within limits, a push rod, which is connected to all four plugs with a gear train to rotate the plugs, is pushed in and out to make the roundness check of each hole. This system eliminates the necessity of rotating the part itself.

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HERE'S A NEW SLANT ON
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24808 PLYMOUTH RD. • DETROIT 39, MICH.
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MEN YOU SHOULD KNOW

Frank W. Glaser is now a vice president and director of the Alloy Precision Castings Company, Cleveland licensee of the Mercast Corporation, in charge of new development work, engineering, and production operations.

The Lodge & Shipley Company has announced the appointment of **Joseph V. Delaney** as vice president. Mr. Delaney has been serving and will continue to serve as a director of the company and general manager of the Hamilton division.

Steve Jerome has been appointed general manager of Wagner Brothers Equipment Company, Detroit finishing equipment manufacturers.

President **James R. Bradburn** of ElectroData Corporation has announced the appointment of **Joseph B. Rice** as vice president-manufacturing of that company. Mr. Rice will continue to serve as assistant secretary of the Pasadena digital computer firm, an affiliate of Consolidated Engineering Corporation.

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The PRESS-RITE line is complete with 8 models having capacities from 2 to 85 tons. One of the presses was built to do your particular job. Thousands of Press-Rites are in use daily in leading manufacturing plants.
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45 TON PRESS-RITE —
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Charles B. Tansley has been elected president of Bryant Machinery & Engineering Company, Chicago machine tool distributing organization. At the same time, **Martin J. Wiora,** former president, was elected to the newly created position of chairman of the board.

The appointment of **Frank Lang, Jr.** as resident plant manager of the Brooks Equipment & Manufacturing Co., a recently acquired subsidiary of Borg-Warner Corporation at Knoxville, Tenn., has been announced. For the past year Mr. Lang had been plant superintendent and personnel manager of the Wausau Manufacturing Co., another B-W subsidiary.

Carl Mayer, Jr. has succeeded the late **Carl F. Mayer, Sr.** as president of the Carl Mayer Corporation, Cleveland. The new president has been associated with the industrial oven design firm for the past 10 years and since 1951 has held the positions of vice president and general manager.

C. Herbert Quick has been appointed assistant to the director of research and development of Norton Company. Prior to this he was assistant superintendent of Plant 2, chief inspector, and engineer of ceramic development for the company.

R. J. Stewart, president of The Cleveland Metal Abrasive Company, announced recently that **Howard F. Kulas, Jr.** has joined the company in a management capacity with operating, technical, and sales responsibility. Mr. Kulas was formerly with the Weatherhead Company.

T. C. Carlsen is now general superintendent of Metal Parts Manufacturing and Assembly at Bell & Howell Company, Chicago photographic equipment manufacturer. **Oscar Riese** has succeeded Mr. Carlsen as superintendent of Metal Parts Manufacturing.

G. T. Flammia has been elected vice president and general manager of the Sossner Tap & Tool Corporation of Lynbrook, N. Y., according to a recent announcement by **T. T. Sossner,** executive vice president of the firm. Before joining Sossner in 1948, Mr. Flammia was associated with the Bay State Tap & Die Co. He is now in charge of all production activities in both tap and gage divisions of the Sossner plant.

MEN YOU SHOULD KNOW

Two executives of the Potter & Johnston Company, Pawtucket, R. I., have been elected to top posts in the company. **Edward P. Gillane,** formerly vice president and general manager was recently named president, general manager, and a member of the board of directors. **Wilfred J. Pender,** formerly factory manager is now vice president and factory manager.

Appointment of **Lewis N. Beaver** as plant manager of Dor-O-Matic division, Republic Industries, Inc. has been announced by **George W. Houlsby, Jr.,** president. From 1947 to 1954 Mr. Beaver was plant manager of the Norton division of Yale & Towne Manufacturing Co., Berrien Springs, Mich.

In conjunction with the name change of Micro-Precision, Inc. to Micro-Precision division of Micromatic Hone Corporation, **Frank J. Hoder, Jr.** was recently named general manager. Mr. Hoder was sales manager when, in 1953, Micro-Precision became a subsidiary of Micromatic.

Cleveland Instrument Company has appointed **Robert F. Baskin** as manufacturing manager in charge of engineering and production. Mr. Baskin was formerly a production engineering supervisor with Brush Electronics Co., where he was responsible for the design and production engineering of electro-mechanical instruments.

Newly appointed Works manager of the Marine and Industrial Engine division of Chrysler Corporation is **Norman R. Reno,** according to **William A. Martin,** division president and general manager. R. S. Bright is now general manager of the newly formed Supply division of Chrysler.

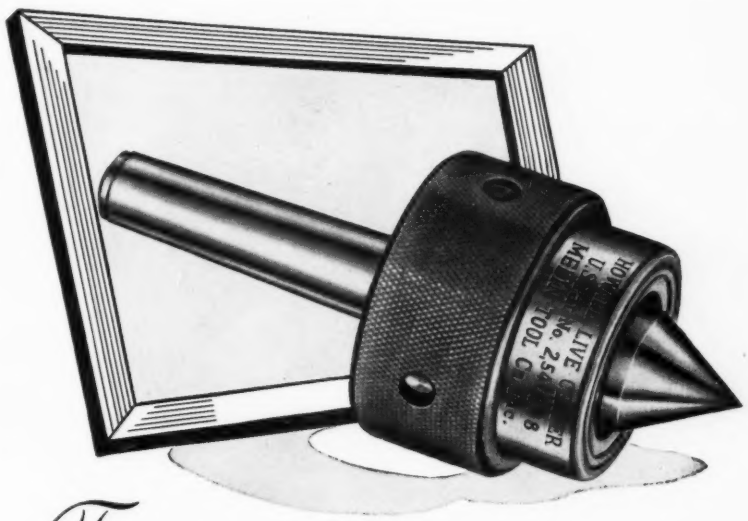
S. L. Crawshaw, nationally known gearing industry executive, has been appointed to the position of assistant to the president of the Philadelphia Gear Works, Inc. Author of numerous technical articles on gearing, Mr. Crawshaw holds several gearing patents.

Tinius Olsen II, in succeeding his father, **Thorsten Y. Olsen,** as president of the Tinius Olsen Testing Machine Company, represents the third generation of Olsens to guide the 75-year-old company. Thorsten Y. Olsen has been elevated to the position of chairman of the board.

Kearney & Trecker Corporation's board of directors has elected **Ralph W. Burk,** former vice president in charge of sales and manufacturing, to the new post of executive vice president. In addition, **Raymond L. Bischoff** was elected financial vice president.

M. B. Pendleton, president of the Plomb Tool Company, Los Angeles, has announced the appointment of **G. E. Jones** as vice president and manager of the company's PROTO Tools division in Jamestown, N. Y. Mr. Jones joined the Jamestown Plant in 1947 as division comptroller and served also as assistant manager for the last several years.

Manager of the newly-established Can division of White Metal Manufacturing Company of Hoboken, N. J., is **William T. Suggs.** The division manufactures aluminum cans for electrolytic condensers and capacitators, as well as other impact extrusions.



Finest **LIVE CENTER MADE**

. . . HERE'S WHY

★ **BACK UP RING** assures positive rigidity.

★ **Bar Expansion Eliminated by means of Thrust Spring.**

★ **Special alloy tool steel spindles, hardened and ground.**

★ **Matched precision ball bearings, mounted in tandem.**

★ **Oil impregnated bronze tail bearing.**

★ **Points pre-loaded and ground after assembly.**

★ **A distinctive oil seal in front of bearings protects them from all foreign matter. Chips, dirt and cutting oil cannot reach the bearings.**

The HOWARD Live Center is the *ONLY* center that offers the patented *BACK UP RING*. The Ring maintains solid contact between the quill and head of the center . . . thus greatly increases over-all rigidity.

Send for the new MELIN TOOL Catalog No. 54-C . . . it lists, in addition to specifications and prices on the HOWARD Live Center, the complete MELIN TOOL End Mill Line.

MELIN TOOL CO. INC.

MELIN TOOL COMPANY, INC.
3371 West 140th St.
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1031

WORK UNIFORMITY ATTAINABLE BY PRESS BED JACK

A method to obtain uniformity of work in press operations is most desirable. Such a method has been developed through a device designed specifically for use in a variety of punch press operations. It is the Dayton Rogers Press Bed Jack — a hydraulic relief unit offering work uniformity performance and several safety features.

Operations which can be controlled with this jack are: briquetting; coining; embossing; marking; pressing; riveting; sizing; stenciling; staking; sub-assembly; and swaging.

The unit may be mounted to the bolster plate of the press or fastened to the press bed proper. By fastening to the press bed proper, it allows removal of the bolster plate without disturbing the press bed jack. This unit serves as a definite safety overload means for the average press on such operations as shown above. When a preset tonnage is reached the jack automatically relieves, allowing precise control of the operation, even though variations are present in the stock. As an example, the depth of coining can be held to ± .001" even though stock thickness varies ± .020".

This safety press bed jack is designed to withstand cycling every time the press cycles while operating at full rated tonnage. Table I gives operational data on various sizes available.

The device consists of a hydraulic jack (or cylinder) connected in series with an accumulator — the whole system being precharged with oil at a pressure that will give the desired tonnage. When the prescribed pressure is attained in the die, pressure pins force the jack to retreat and proper forming of work is accomplished.

Oil forced from the hydraulic cylinder goes to the accumulator.

THIS
TO
THIS
¼" to 1" Round Bar Stock
MACHINED AUTOMATICALLY
...at lower cost
Semi-Finished Auger Bit
see how
GREENLEE DOES IT!
VISIT BOOTH No. 1221 AT THE 1955 MACHINE TOOL SHOW
See this production problem solved on a Special Greenlee Bar Automatic. It will be in normal production operation here at the show.
GREENLEE CAN HELP SOLVE YOUR PRODUCTION PROBLEMS
The creative know-how that built this special auger-bit machine is available to you. Make full use of Greenlee specialized engineering skills and ingenuity.
Take advantage of its cost saving possibilities.
GREENLEE
GREENLEE BROS. & CO.
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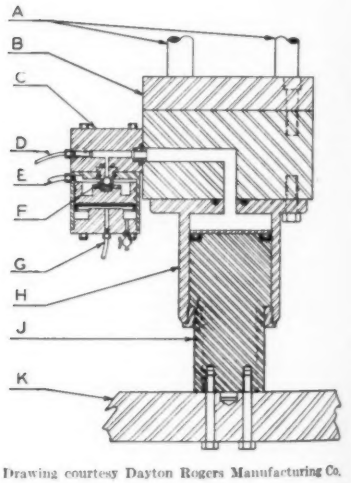
write for further information
CIRCLE INFORM-A-GRAM KEY NO. 1041



Drawing courtesy Dayton Rogers Manufacturing Co.

The diagram details the hydraulic circuit of the Press Bed Jack. The components are identified by letters as follows: (A) die pressure pins; (B) pressure pad; (C) relief valve assembly; (D) pressure line from pump; (E) drain line to sump pump; (F) relief port; (G) air line to pressure regulator; (H) cylinder assembly; (J) piston assembly; (K) base mounting plate.

	DRJ-1	DRJ-2	DRJ-3	DRJ-4
MAXIMUM ALLOWABLE TONNAGE*	19	28	48	66
MAXIMUM AIR PRESSURE USED (PSI)	30	30	30	.30
MAXIMUM OIL PRESSURE (PSI)	3000	3000	3000	3000
BORE (INCHES)	4.00	4.875	6.375	7.50
AREA (IN^2)	12.56	18.66	31.92	44.18

*It the Jack is to be used only as a safety release device (i. e. — not relieved every cycle and not required to return in time for next stroke) the hydraulic circuit can be revised and tonnage ratings increased 2½ times.

TABLE I

The accumulator in turn forces this oil back into the cylinder as the press retreats, thereby causing rapid recovery of the jack.

The pneumatically operated hydraulic pump provides initial charging of the system and automatically maintains this charge. An air loaded relief valve, shown at C, is inserted in the system to aid initial bleeding and to act as a safety pop-off valve.

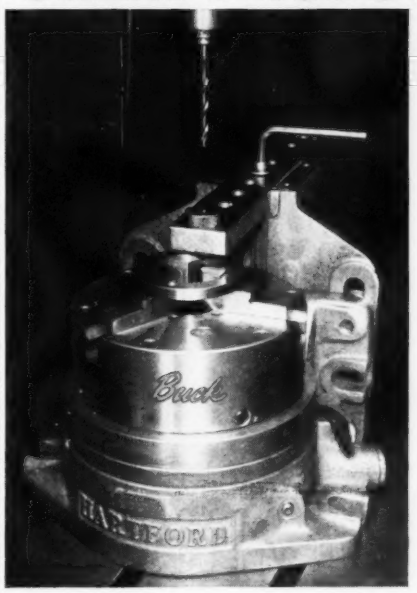
The pneumatically controlled relief valve is a precision monel piston and cylinder assembly. The piston exerts a force on a tungsten carbide ball which is nested in a hardened tool steel seat, shown at F. This seat is the relief port. The area ratio of the relief valve air cylinder to the relief port is 100:1. As a result, the unit oil pressure required to open the system to drain equals 100 times the unit air pressure in the relief valve air cylinder.

Another important feature of the jack which should not be overlooked is the safety it offers against broken press frame, crankshaft, die, etc. which occurs when a part gets jammed in the press. The unit makes such an occurrence impossible, since it relieves at the preset tonnage.

Presses incorporating press bed jacks are easily restored to service if ever locked on bottom dead center, by releasing the oil pressure in the jack to allow it to collapse. After the press has been turned over, the jack can be pumped up to desired tonnage.

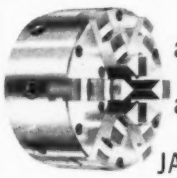
"Extending the Range of Modern Surface Grinding," a new 16mm color, sound film, examines new grinder features and attachments that permit application of the surface grinder to hundreds of jobs other than ordinary flat grinding. The DoAll Co., Des Plaines, Ill., will loan you the film.

GREAT PRODUCTION TEAM



HARTFORD
Super Spacer
PLUS
Buck
AJUST-TRU
PAT. NO. 2,639,157
CHUCKS

.0005" Precision



6 and 3 and 2 JAWS

3-jaw and 6-jaw models made in 4", 5", 6", 7½", 9" sizes. 2-jaw Aviation chucks for holding odd-shaped parts in 6", 7½", and 9".

* * *

Buck also makes air chucks and 4-jaw independent chucks.

Precision . . . *faster* . . . is always the rule with Buck Ajust-Tru Chucks. The excellent indexing qualities of the Hartford are better than ever with a Buck scroll chuck.

First, machinists can adjust it to dead true *within 1 minute.* Second, *without further adjustment* duplicate parts can be chucked within .0005" precision. *No other chuck comes close to matching Buck speed and precision.*

Buck makes Hartford Super Spacers, or any indexing equipment, better than ever. Send for catalog with complete details.

BUCK TOOL COMPANY
718 SCHIPPERS LANE • KALAMAZOO, MICH.

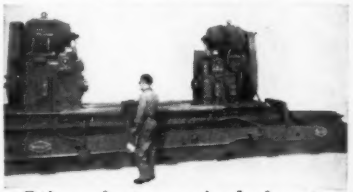
CIRCLE INFORM-A-GRAM KEY NO. 1051

TWO-WAY HORIZONTAL DRILLING, BORING AND TREPANNING MACHINE

Variable speeds at constant horsepower and the ability to handle pieces of from 6" to 60" for drilling, boring and trepanning distinguish this new machine designed and manufactured by Baker Brothers, Inc., for the El-Segundo, Calif., Division of Douglas Aircraft Co., Inc.

A two-way horizontal machine, one end can be adjusted on a rack and pinion to accommodate varying lengths of work. The two 25 hp motors are variable through Reliance VS drives from 50 to 1,700 rpm with full power maintained through back gearing. In high range, the sheave drive is direct to the spindle and in low range through the back gears.

Both units have a 40" length of stroke and both are equipped with lathe-type spindles to permit chucking of a part for rotation or chucking of tools for rotation. When used for trepanning, both work and tool rotate. Maximum drill diameter is 4".



Other features include piped high pressure coolant through the hollow spindle at a pressure of 500 psi, and automatic centralized lubrication throughout.

Cabinets housing electronic controls (not shown in photo) are mounted ends of the machine.

SPECIAL INTRODUCTORY UNIT

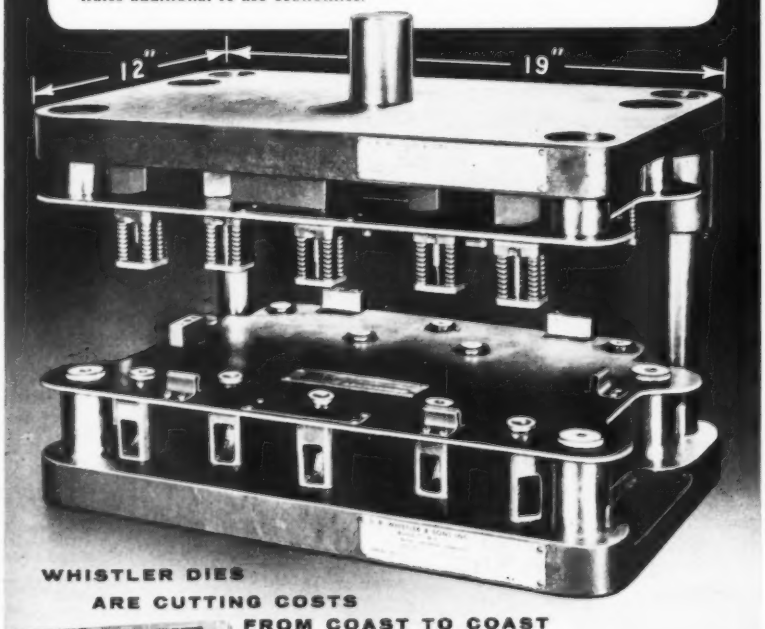
WHISTLER

10 HOLE MAGNETIC PERFORATING DIE

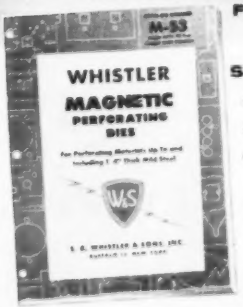
Cut die costs drastically, start production quicker. This M-12-14 Complete Introductory Unit includes a set of blank templates, ten punches, dies, strippers and punch and die retainers complete to make up a ten hole precision perforating die. Any diameters from ⅛" to ½" to your selection. Catalog illustrates additional re-use economies.

$675

NET F. O. B. OUR PLANT



WHISTLER DIES ARE CUTTING COSTS FROM COAST TO COAST



SEND FOR CATALOG Illustration shows how quick and simple it is to set up a Whistler Magnetic Perforating Die ready for production. Larger standard units can be added to suit your requirements.

S. B. WHISTLER & SONS, INC.

Manufacturers of Adjustable, Magnetic and Custom Built Dies for All Industry

748 Military Road **Buffalo 23, New York**

CIRCLE INFORM-A-GRAM KEY NO. 1061

NEW EDITION OF POPULAR LATHE REFERENCE

Publication of the newly revised fifty-third edition of "How to Run a Lathe" has been announced by South Bend Lathe Works.

This Edition covers the use of toolmakers' buttons for locating work on the lathe face plate, the use of the steady rest, follower rest, internal grinding attachment, and precision gage blocks.

The illustrated chapters of the text present data on such subjects as the correct installation and leveling of the lathe, grinding cutter bits, turning, boring, thread cutting, taper turning, drilling, reaming, tapping, machinability ratings and cutting speeds, allowances for finish turning, filing, polishing, grinding, reaming, lapping, honing.

"How to Run a Lathe" is available from South Bend Lathe Works, South Bend 22, Ind. Paper bound copies are $0.50.

Crucible Steel Company of America has appointed **Edward W. Sparkes** as manager of its Syracuse Branch, according to an announcement by **J. D. Glenn,** general manager of sales. Mr. Sparkes has been acting branch manager there since last October.

Robert F. Bourne has been appointed to the newly created position of director of sales — national accounts for The Colorado Fuel and Iron Corporation. **Edwin F. Lord** succeeds Mr. Bourne as general manager of sales for the Claymont Steel Products Department of CF&I.

Gates Engineering Company recently announced the appointment of **John F. Ewert, Jr.** as director of advertising and sales promotion. He previously directed advertising for the Strunk Equipment Company.

Henry R. Merrill, a director of Behr-Manning and its assistant general sales manager for the past two years, succeeds the late **John M. Cook** as general sales manager of the division. Mr. Merrill has been with the company since 1930.

Edward D. Jackson has been appointed general sales manager of the Axelson Manufacturing Company, a division of U. S. Industries, Inc. With headquarters at Axelson's main office in Los Angeles, he will direct the national and international sales operations for all Axelson products, including heavy duty lathes, milling machines, and aircraft components.

A. Milne & Company, nationwide distributors of solid and hollow tool steels has named **William L. Morris** as Birmingham, Ala., sales representative.

In order to improve service to socket screw distributors and customers on the West Coast, The Bristol Company has just appointed **D. J. Yates** as socket screw field representative in Los Angeles. Mr. Yates has had almost ten years experience handling Bristol socket screw products in the Pittsburgh area.

G. Frederick Pope is now manager of the Harrisburg office of Fidelity Tool Supply, Inc.

Thermal Research and Engineering Corp. of Conshohocken, Pa., recently announced the appointment of **William Neundorfer** as district sales engineer in charge of their newly established Cleveland office. The company specializes in combustion and heat transfer equipment.

Newly appointed sales manager of National Tool Company is **Howard C. Liebing.** He has been with the company since 1941, serving as production control manager for the past six years.

Roderick L. Smith succeeds **W. Grover Snow** as Norton Company's abrasive engineer in the Minneapolis, Minn., area. Mr. Snow recently retired after nearly 40 years service with the company.

Arthur W. H. Towne is now sales manager for the Industrial Division of T. R. Finn & Company Inc., specialists in shock and vibration control.

Jack Conrad and **Arthur Sheridan** have been named regional sales managers for Heller Brothers Company of Newcomerstown, Ohio, America's oldest file manufacturer. Mr. Conrad is now Central manager at Chicago and Mr. Sheridan is Eastern manager at New York City.

Specify POPE
HEAVY DUTY
WHEEL HEADS
"A"
Note the big precision bearings and the big shaft.
A pair of precision thrust bearings stabilize the shaft against any axial movement in either direction. (No end play)
The double row cylindrical roller bearings carry the radial loads with ease and at low temperature.
"B"
Power-Max 25 HP—available with standard No. 30, 40, 50 or 60 milling machine noses.
Send us your specifications and ask for New Bulletin 5-8
Taper mounting provides for precise individual preloading of the radial bearings.

POPE Heavy Duty Wheel-Head Spindles are designed for a wide variety of applications such as grinding, boring, milling, drilling and many other operations requiring PRECISION COMBINED WITH RUGGEDNESS in the spindles.

For continuous production and trouble-free operation THERE'S NOTHING LIKE A POPE SPINDLE WITH ROLLER BEARINGS.

BOOTH NO. 117

No. 94

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION

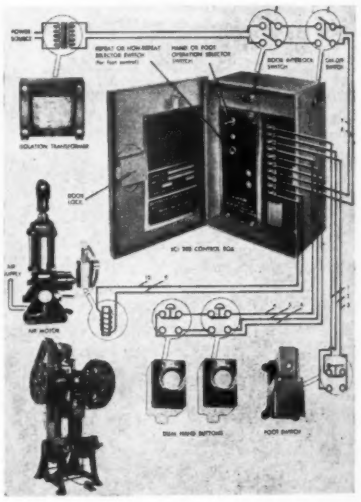
CIRCLE INFORM-A-GRAM KEY NO. 1071

Controlled Repeat or Non-Repeat Machine Cycle

A versatile, simple, easily installed control system, which provides complete cycle control on any machine equipped with a mechanical tripping mechanism, is found in a new control principle — stored electrical energy.

This is known as the SCI 200 Electrical Control system, built by Security Controls, Inc, 225 Franklin St., Buffalo 2, N. Y. and is shown in the accompanying photograph. It consists basically of a control box plus either dual hand buttons or a single foot switch for each operator on the machine. Electrical energy from standard plant voltages is "stored" in the control box until both hand buttons are depressed, or until the foot switch is depressed, disconnecting the plant voltage and simultaneously releasing the stored electrical energy to operate the air motor through a solenoid control valve. With the supply of stored electrical energy exhausted, hand buttons or foot switch must be released to permit recharging of the control for the next machine cycle.

The foot switch can be set to provide repeat cycle, as it is installed in conjunction with approved types of guards enclosing dangerous areas. Both hand buttons and/or foot switches are installed in series when more than one operator is employed at a machine, making it necessary for all hand buttons, or all foot switches to be depressed to operate the machine.

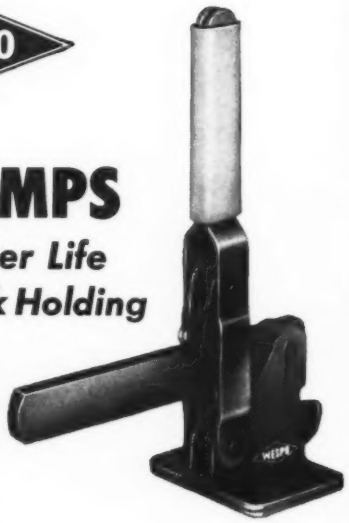


An external on-off switch is mounted on the control box. All other controls are inside the control box, protected from tampering by a locked door. An interlock switch cuts off the electrical current if the control box door is left open, preventing unauthorized change of the pre-set cycle. Toggle switches are provided for (1) selection of hand or foot operation and (2) non-repeat or continuous cycle.

The SCI 200 Electrical Control System is a standardized unit which will accommodate many different types of machines, making it unnecessary to stock a variety of spare parts.

WESPO

Improved
TOGGLE CLAMPS
Engineered for Longer Life & More Positive Work Holding



NOTE THESE FEATURES:
1. Reamed holes—for better bearing
2. Hardened serrated bushings —to prevent turning
3. High tensile strength rivets — for longer service. Corrosion resistant black oxydized finish

A CLAMP FOR EVERY WORK HOLDING NEED

35 SIZES AVAILABLE

Write Today for Free Bulletin

WEST POINT MFG. CO.
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CIRCLE INFORM-A-GRAM KEY NO. 1081

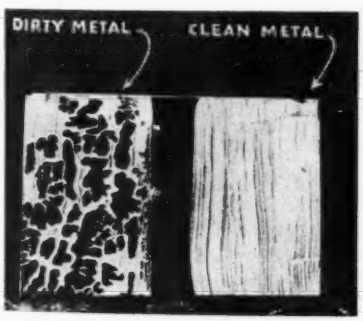
FLUX OFTEN INDICATES DIRTY BRAZING SURFACES

Given a well-cleaned, fluxed surface to work on, silver brazing alloys will wet easily to produce strong, leak-tight joints. Flux helps the molten alloy wet metals by reducing surface tension and by removing and inhibiting oxidation. But unless the flux itself wets the metal initially, there is little chance that the brazing alloy can do so. (This does not apply to the special alloys developed to silver-braze copper without flux.)

Flux is compounded to remove a certain amount of oil and oxide, such as are commonly encountered on mill supplied materials. However, excessive accumulations of dirt, grease, oil and oxides can retard wetting by both the flux and alloy. Consequently you can tell if the brazing alloy is likely to wet by examining the way the flux adheres to a surface. To illustrate this point, technicians at the engineering laboratory of Handy & Harman, 82 Fulton St., New York 7, manufacturer of silver brazing alloys and fluxes, took a thoroughly oily steel plate, which had been lying around the shop; cleaned and degreased one half of the plate, and the other half they left intact. They then applied standard Handy Flux to each half. The results are shown in the accompanying photograph.

Note the even coating of flux on the cleaned half, and the fluxless islands on the oily half. If brazing were attempted on a piece in the latter condition, the alloy would wet so sparsely that a mechanically weak and probably leaky joint could be expected. If the flux wets poorly, the wisest and most economical thing to do is to clean and degrease the pieces before attempting to braze them.

The most common cleaning procedure is: Degrease in a vapor degreaser or suitable solvent. Then remove any oxide on the joint surfaces by pickling or by touching the piece to an abrasive belt or wheel. When handling cleaned parts, do not touch the joint faces; a greasy finger print is as much of an offender as a patch of oil or oxide.

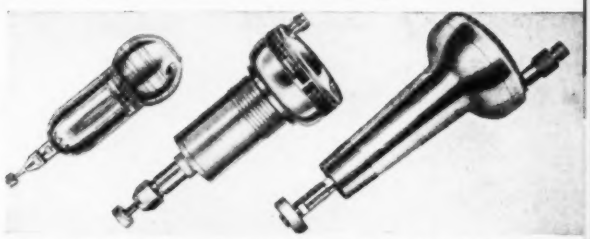


Indicative of improper cleaning are the numerous islands at left where the flux did not wet the metal. If brazing were attempted on this dirty section, the brazing alloy would cover only the fluxed areas, leaving voids elsewhere.

Onsrud®

air turbine tools and motors for faster, smoother grinding and power

air turbine PORTABLE GRINDERS light weight . . . always run cool



B-1B, 1/6 HP, 75,000 RPM ...weighs only 12 ounces, a precision, quality tool.

D-1A, 1/4 HP, 50,000 RPM ...a medium duty unit with dependable power and speed.

E-1A, 1/2 HP, 38,000 RPM ...heavy duty, proper speed to get grinding jobs done.

Write for Onsrud Grinder Bulletin 1129

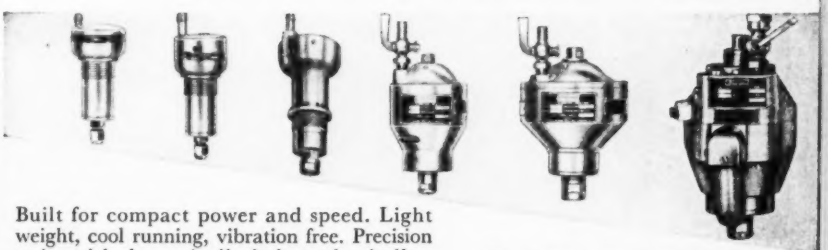
•

Onsrud D1-S *air turbine* HOLE GRINDER

¼ HP, 50,000 RPM air turbine motor gives speed for precision grinding. Offset head positions wheel in any axis from center to 1" from center.

Write for Onsrud D1-S Hole Grinder Bulletin 1126

Onsrud air turbine motors



Built for compact power and speed. Light weight, cool running, vibration free. Precision units with dynamically balanced spindles. Speeds from 22,000 to 50,000 RPM... ¼ to 2 HP.

For motors to use on equipment you build, write for Onsrud Air Turbine Motor Bulletin 1138.

ONSRUD MACHINE WORKS, INC.

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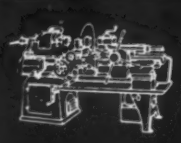
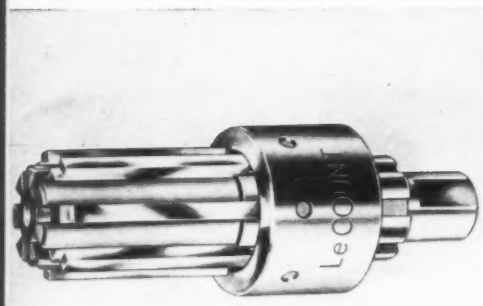
Portable Tool Representatives Wanted . . . Good Territories Available

CIRCLE INFORM-A-GRAM KEY NO. 1091



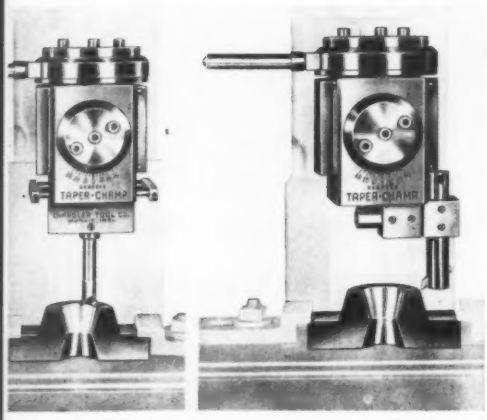
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



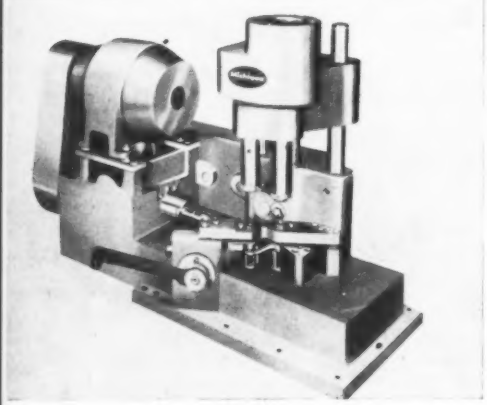
SPECIAL MANDREL . . .

Production problems encountered with unusual internal bore shapes are readily solved with special mandrels such as this seven jaw unit. It locates in seven machined cam grooves of a hardened steel piece, for instance, and a stop locates the part for periphery grinding. Get details from Le Count Tool Works, Inc., 390 Capitol Ave., Hartford, Conn., or **Inform-A-Gram No. A1.**



GET BETTER TAPERS

The "Taper-Champ" boring and turning tool tapers in either direction (as shown) when used on jig borers, boring mills, etc. and for blanking, piercing dies, patterns, and other operations. Shanks are interchangeable so the tool can be used in several different machines. Get the details from Chandler Tool Co., Muncie, Ind.
Inform-A-Gram No. A2.



TWO-WAY DRILLING

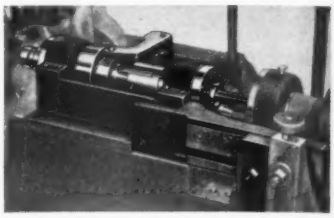
Here's a compact, economical unit that permits right-angle drilling on any standard drill press while utilizing only one feed source on the press. The unit shown is drilling four holes in a gear shift lever with only three spindles doing the actual drilling; two vertical holes and one right-angle. Michigan Drill Head Co., Box 4643, Detroit 34, Mich. **Circle A3.**

NEW GRINDER . . .

Streamlined new Model 240 double horizontal spindle grinder is equipped with Besly's exclusive "Sealed Spindle Quill" construction. Controls are automatic and accessible from either side of the machine. Besly-Welles Corp., Beloit, Wis. **Circle No. A4.**

SLIDING HEAD LATHE . . .

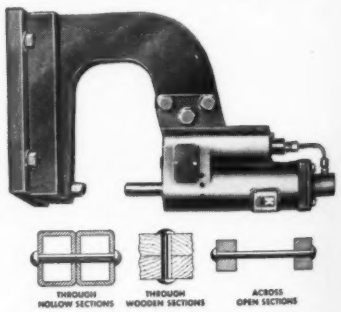
This new sliding head automatic lathe, the Howard D-187, mass produces parts up to 3/16" dia., 2¾" long. Using the same machine base, power units, and tooling employed on the ½"-capacity Howard D-500, extremely high finish is achieved by spindle speeds up to 15,000 rpm, under pressure lubrication. Extreme tolerances are held by an



entirely new, highly sensitive sliding head with completely independent pulley carrier bracket which eliminates all deflection of the spindle and slide. Howard Automatic Div'n, Detroit Cam & Tool Co., Ferndale, Detroit 20. Mich.
Circle Inform-A-Gram No. A5.

SPINNER RIVETER . . .

The Spinner Riveter has been redesigned to incorporate an adjustment that allows air to be diverted either to the spinner or

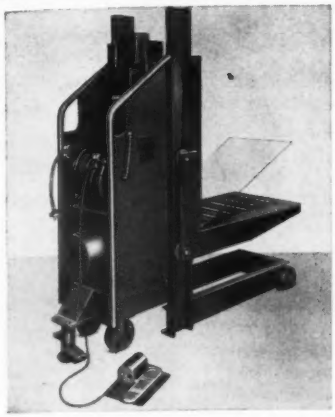


to the hammer for balancing the relative speed of the spinner and the amount of force behind the rivet head. The hammer blows become lighter as the spinning speed is increased, and heavier as the spinning speed is decreased, so that rivet heads can be formed without danger of bending or swelling the shank. Catalog 50 from Keller Tool Div'n of Gardner-Denver, Grand Haven, Mich., gives details.
Circle Inform-A-Gram No. A6.

ON PARADE

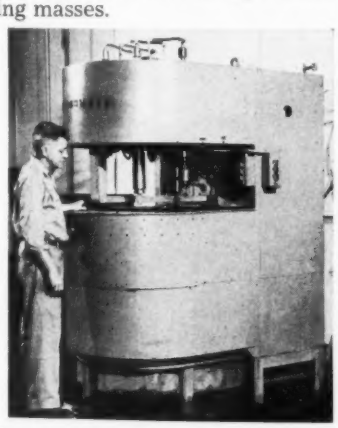
Mail FREE Inform-A-Gram Card for MORE Details.

ELEVATOR-STACKER . . .
The brand new 3,000-lb. capacity Portelvator "R" stacker has a roller equipped platform



20" by 36", with hinged cover plate. Its platform travels a distance of 41" to a maximum height of 48", at a speed of 58" per min. Contact The Hamilton Tool Co., 832 S. Ninth St., Hamilton 1, Ohio.
Circle Inform-A-Gram No. A7.

ROTO-FINISHING . . .
A unique, semi-automatic mechanical finishing machine for small lot production or experimental work has been developed by Roto-Finish. It uses either wet or dry finishing materials and can also be used for coloring operations. The "Roto-Mite" allows interchangeable use of several tubs of different type finishing masses.



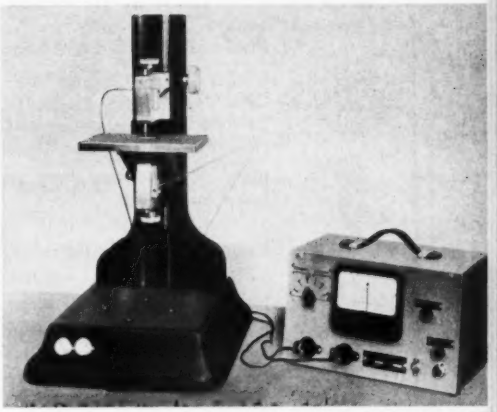
Parts are held in fixtures attached to the lower ends of the vertical mounted rotating spindles. Roto-Finish Co., Kalamazoo, Mich.
Circle Inform-A-Gram No. A8.

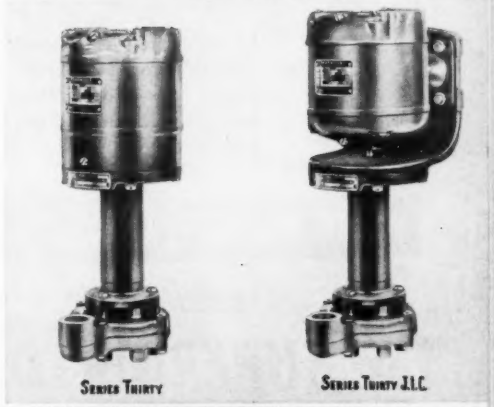
ULTRA-ACCURACY ...
Measurement of gage blocks to millionths, or even half-millionths, is the purpose of the new opposed-head electric microcomparator made by Cleveland Instrument Co. The block being measured need not be wrung against an anvil and true size measurement is assured. Bulletin 552 gives details. Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, or —
Inform-A-Gram No. A9.

"ABRASIVE-PROOF"
There are no packings or seals to wear on these Super Flo immersion-type centrifugal pumps for coolants, cutting oils, solvents, and other liquids. They are available in various lengths, discharge pipe sizes, and positions and to conform to J.I.C. standards. Graymills Corp., 3705 N. Lincoln Ave., Chicago 13, Ill., will send details.
Inform-A-Gram No. A10.

FOR TRUE ANGLES ...
Here is one of four large black granite (biabase) angle plates recently made by Rahn. It is shown on a 48" by 72" surface plate. The faces are finished to a flatness tolerance of 0.0005" and the tolerance for the 90° angle is 0.0002" in its 24" height. Its base is 18" by 24". Rahn Granite Surface Plate Co., 641 N. Western Ave., Dayton 7, Ohio.
Inform-A-Gram No. A11.

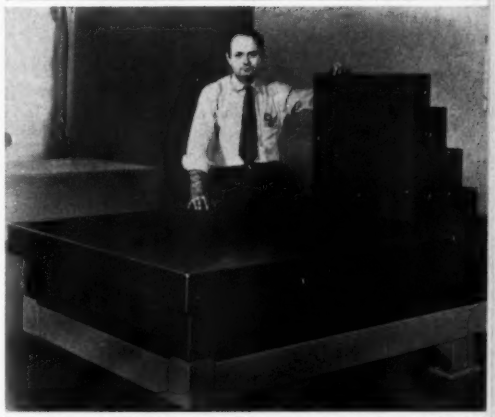
FOR LONG THREADS
Ten ft. of thread length can be ground in one setting with this new precision thread grinder, style 210, from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32. Longer threads can be ground in sections or by turning the work end for end.
Inform-A-Gram No. A12.





Series Thirty

Series Thirty J.I.C.



Punches and Dies

...for foot and power presses

Standard Punches and Dies of all sizes and shapes in stock—or made promptly to order. Also Adaptors and Die Shoes to convert your press. For power, foot or hand operation.

Round, square, rectangular, slotting, notching, louvre, angle, multiple, knock-out and other shapes. Precision made from high grade tool steel. More than 25,000 sets in stock to choose from.

Send for free illustrated catalog No. 154-A NET PRICE SHOWN! *What are your punch and die needs?*

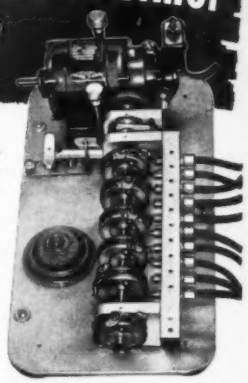
WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1121

THIS CLEVER, DEPENDABLE

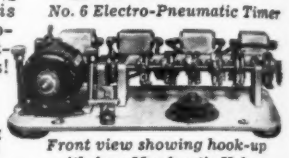
Electro-Pneumatic Timer

Controls Intricate Work Cycles...



No. 6 Electro-Pneumatic Timer

This simple but astonishingly ingenious unit distributes air pressure to air-operated cylinders, presses, hammers, work feeders, clamping fixtures, chip blowers, work ejectors . . . each independent as to start, duration and end of cycle. Simply connect up 6, 12 or more cylinders in numerous sequences from 2½ to 33½ seconds. *You need this inexpensive* Mead Electro-Pneumatic Timer for cost-saving automation jobs!



Front view showing hook-up with four Meadmatic Valves

Write Factory or Nearest Mead Representative For Bulletin HA-75

Write for our cost-saving catalog. Or let the Mead Man show you.

(See Volume III Thomas' Register for nearest distributor's address, phone number.)

MEAD SPECIALTIES COMPANY

4114 N. Knox Ave., Dept. HA-75, Chicago 41, Ill.

PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 1122

for SUPERIOR DESIGN use... Hydro-Line CYLINDERS

SERIES "J" CYLINDERS

For rugged, trouble free SERVICE

- *CARTRIDGE . . . rod-wiper, packing, bushing in one unit.*
- *RUGGED BODY . . . all steel end caps and barrel.*
- *PISTON RINGS . . . step-cut joint, sealing in both directions, long life, minimum leakage.*
- *PRESSURE . . . 2,000 psi heavy-duty . . . 3,000 psi non-shock.*
- *SIMPLICITY . . . no tie-rods . . . no retainer rings.*

Write for Bulletin No. 53

Hydro-Line *Manufacturing Co.*

5669 PIKE ROAD • ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1123

LASSY WORK HOLDERS

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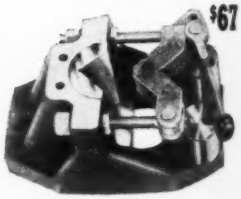
1. SAVE HUNDREDS OF TOOLING $$$$$
2. CONVERT TOOLING TIME TO PRODUCTION TIME
3. INCREASE PRODUCTION AND QUALITY

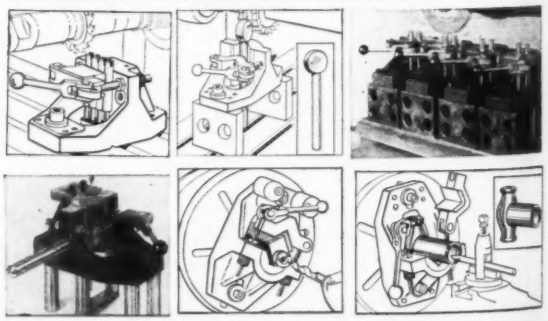
Plus! LOW INITIAL COST. NOTHING ELSE LIKE IT.



$67

Model P2 Cap. ½" to 2" Other Models and Sizes to 4" Cap.

Just a few of the many setups that can be made rapidly with Multi purpose Work Holders and STANDARD LOW COST Accessories.

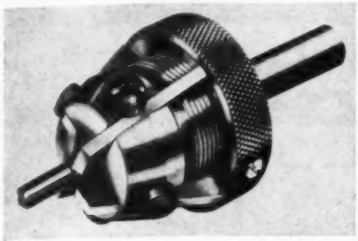


Order direct or write for name of Stocking Dealer in your area. Illustrated circular FREE.

LASSY TOOL CO., Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1124

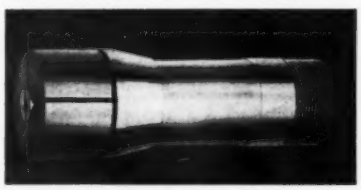
This Standard Tube Burring Tool will face the end and chamfer the outside and inside of standard tubing. Its pilot reamer guides it for uniform chamfers and eliminates



any burr on the inside of the tubing. Get details from Genesee Mfg. Co., Inc., 566 Hollenbeck St., Rochester 21, N. Y., or —
Circle Inform-A-Gram No. A13.

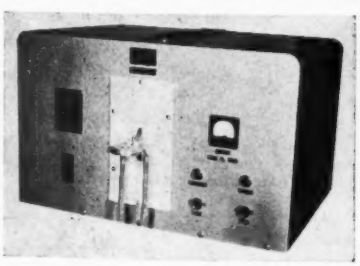
The New Line of Oversize Steel Dowel Pins introduced by Acme Industrial Co., 200-222 N. Laflin St., Chicago 7, are for repairing doweled parts. They range from 0.002" to 0.005" overall nominal diameter in the popular sizes.
Circle Inform-A-Gram No. A14.

Equally Effective on Lathes, tool and cutter grinders, and cylindrical grinders, Royal internal collets are self-releasing and fit standard 5C



lever and handwheel drawbars. Tolerances up to 0.0001" are easily achieved by touch-grinding pads or using machinable pads with given setups. Royal Products, 88 Union St., Mineola, L. I., N. Y., or —
Circle Inform-A-Gram No. A15.

Conservatively Rated Output of 3 KW, simplicity of design, and rugged construction assures continuous trouble-free operation of the new Model IH-3 induction heating unit manufactured by Industron Corp.,



50 Brook Rd., Needham Hts., Mass. For safety's sake, an output transformer makes possible extremely low voltage in output coil.
Circle Inform-A-Gram No. A16.

MICRO-FINISH DRILL JIG BUSHINGS

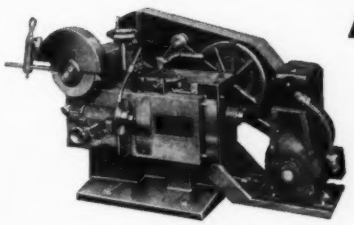
80 TO 3/32
.0135 TO .0937

- High Micro-Finish for straighter holes. More uniform cutting pressure. Longer drill life.
- All standard body styles available.
- Drill sizes #80 to 3/32 (.0135 to .0937).
- Hole Diameter Diamond Lapped to (—.0000 +.0002)
- No counterbore. Full length support reduces flexing of drill, increases life and accuracy.
- Chamfered Hole protects against drill breakage.
- Concentric to .0002 (I.D. to body O.D.)
- Special sizes to your specifications.

ACME TOOL COMPANY
71 West Broadway, New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1131

Sharpen 40 to 150 Saws At ONE Time

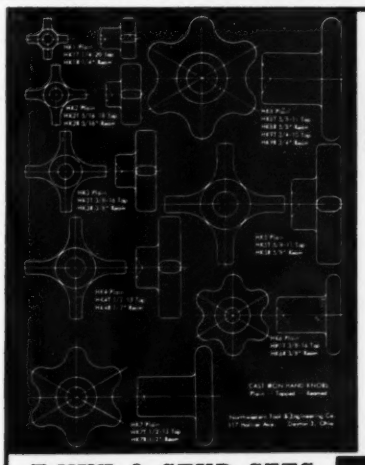


WITH A
Wardwell Model 35T

Sharpen your saws faster and better with the new Wardwell Model 35T. You make a tremendous saving both in saw sharpening costs and in purchases of new saws.
Wardwell 35T sharpens milling, slitting and screw slotting saws in groups of 40 to 150—**at one time**—in **one** setting. Any size, from 2" to 5½".
Completely automatic. Just start machine — it does rest. Reduce maintenance costs **now** with the WARDWELL 35T. Write for free bulletin No. 35T today.

WARDWELL Manufacturing Co.
3809 Ridge Rd. Cleveland 9, Ohio
Maker of largest line of saw and tool sharpening machines

CIRCLE INFORM-A-GRAM KEY NO. 1132



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QUARTER TURN SCREWS • SOCKET SHOULDER SCREWS • JIG FEET (three types) • FIXTURE KEYS (six sizes) • LATCH BOLTS (std. & long) SPHERICAL WASHERS • SPHERICAL FLANGED NUTS • STRAP CLAMPS (two types) • HARDENED NUTS & WASHERS • FLANGED NUTS N/C & N/F • CUT THREAD STUDS • TEE-NUTS (twelve sizes) • COUPLING NUTS • ADJUSTABLE STEP BLOCKS • STAR TYPE HAND KNOBS • HEXAGON TYPE HAND KNOBS • KNURLED HEAD SCREWS

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Severance CARBO-MILLS GROUND-from-the-Solid

The all-purpose CARBIDE mill at LOW cost. Use them same as you would High Speed mills or Rotary Files—Same machines—Same speeds (or higher). No more, time consuming, "kid-glove" care. Just chuck them up in your regular equipment and watch these RUGGED CARBO-MILLS go to work!

CARBO-MILLS ASK NO SPECIAL FAVORS

3/32" SHANKS

7 Standard Numbers, featuring REAL cutting teeth to remove stock faster over long periods of use—as well after regrinding as when new.

CARBO-MILLS by the ORIGINATOR of Ground-from-the-Solid Mills

IN PORTABLE TOOLS

1/8" SHANKS
12 STANDARD NUMBERS
THE POPULAR WORK BENCH SET

NO PROBLEM OF TOOTH CHIPPING OR BRAZE-FAILURE

CARBO-MILLS PREFERRED BY OPERATORS!

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20 Standard Numbers (only 9 illustrated) cover the widest possible range of uses. Don't continue losing valuable time and money; replace your less efficient Rotary Files with these longer lasting, faster cutting, stamina possessing, CARBO-MILLS at the earliest possible moment!

LAST UP TO 75 TIMES LONGER THAN ROTARY FILES OF HIGH SPEED

DIE MAKERS! ASK FOR THIS SET

Furnished to you in a sturdy wooden case, Di-cor Set No. 40 is a set of 8, ¼" shank CARBIDE mills designed and instituted specifically for you, the Tool and Die Maker. Specially selected shapes—Special tooth patterns and cuts for all types of precision Tool and Die work. You will ply your skills easier and faster than ever before with these personal finishing mills. These CARBIDE mills need absolutely no coddling and will win their way to the the most favored spot on your Work-Bench! Send for complete information and prices today! Ask for Leaflet No. 645

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REGRINDING—Due to CARBO-MILLS being made of Solid Carbide repeated savings are made possible through successive regrinds.

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SAVE TIME • EFFORT • MOTION

Here's fast-acting, positive controlled power for all types of industrial applications.

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ROTATING TYPE—Seven standard sizes from 3" to 14" diameter bore. Larger sizes special. Max. operating pressure 500 psi.

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Sizes from 2" to 8" bore; any length stroke up to 8 feet. Other bores and lengths are special. Four piston rod end types. Operating pressures to 1500 psi.

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IMPROVED QUALITY

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

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Write for Catalog 55-G

METAL CARBIDES CORPORATION MC TALIDE® YOUNGSTOWN 7, OHIO

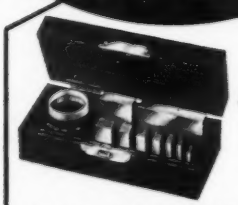
HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 1143

ULTRA-CHEX GAGE BLOCKS *for Every Need!*

Supplied in one Superior Accuracy

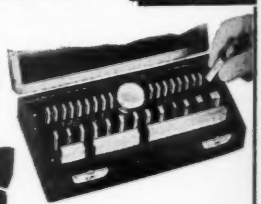
5 MILLIONTHS ± ACCURACY



9 Block Set $22.50
OPTICAL PARALLEL $5.00

Quick Delivery on Small Standard Sets

34 Block Set $125.00
INCLUDING OPTICAL PARALLEL



82 Block Set $275.00 Complete

This Set will supply the needs of any discriminating shop that must work to gage-block precision.

All Sets at "Money Saving Prices" due to Mass Production Methods.

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Dealers: Here's a real profitable line!

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COMPLETE LINE OF PRECISION INSTRUMENTS

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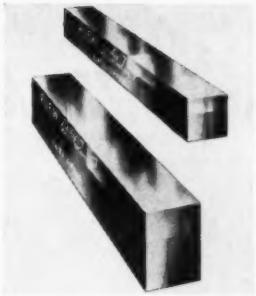
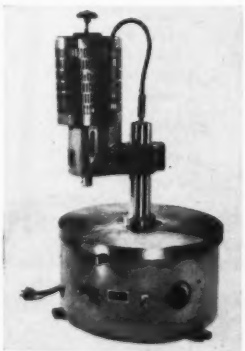
CIRCLE INFORM-A-GRAM KEY NO. 1144

High Speed Steel Tipped Tool Bits are the latest development of Plew Tool Co., Inc., Columbia City, Ind. The cutting tips may be made of any steel and the price is far less than if the tool were made entirely of solid high speed steel. All tools are surface ground to +0.000, −0.004.
Inform-A-Gram No. A17.



This Vacuum Valve has an unusually large flow capacity for its size. It contains no sliding or rotating seals to develop leakage after continued use. The self-cleaning seals require little attention. Bent & Davis Machine Co., 7213 Santa Monica Blvd., Los Angeles 46, Calif.
Inform-A-Gram No. A18.

Multiple Splines, Spiral Flutes, squares, hexagons, etc. can be cut at production rates on any standard drill press with this patented milling head. It cuts 2 to 12 splines and operates in vertical, horizontal, or angular positions. Modern Mfg. Co., Inc., Edgemont & Clementine Sts., Philadelphia 34, Pa.
Inform-A-Gram No. A19.



Tools May Be Mounted on the Central Column of the new electric indexing table developed by Black & Webster, Inc. Its built-in automatic timer is continuously adjustable from 6 to 54 indices per min. and automatically triggers the tools when the table locks in position. For data sheets on the table, write to Black & Webster, Inc., 445 Watertown St., Newton 58, Mass., or —
Inform-A-Gram No. A20.

The Console Oscilloscope, utilizing a 17" rectangular tube, is especially useful and convenient for production test set-ups where work can be placed in front of the operator for detailed observation of data or complex signals. Shown is a 1700 Series model in a modern console, a product of Electromec, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Inform-A-Gram No. A21.

Announcing

Spra-Kool

A NEW, SIMPLE METHOD THAT ELIMINATES DRY GRINDING

AT LAST— A SIMPLE SYSTEM THAT WORKS!

Now, with new Spra-Kool, you can quickly and economically apply spray-coolant to all types of dry grinding and polishing jobs. You'll get a simple, dependable system that *your operators will like to use* . . . one that you can quickly and easily apply to a wide range of work.

PRICE— COMPLETE ATTACHMENT ONLY $37.00

4 OUTSTANDING FEATURES

1 SIMPLE, EASY TO USE—connects to any air line hose, nozzle adjusts to exactly suit work needs. No pumps, settling tanks, or complicated filters. Clean to work with — no flood of coolant, excess spray evaporates.

2 DEPENDABLE, HIGHLY EFFICIENT — simple valve and nozzle settings provide a steady, uniform jet spray to tools and work — unaffected by varying air pressure.

3 ASSURES BETTER FINISHES, INCREASED OUTPUT — cooling combined with forced jet penetration prevents damage to work, increases wheel life, assures better finish and increased output.

4 INEXPENSIVE, COMPLETELY ADAPTABLE — 4-6 hours continuous operation with one gallon of coolant. Compact unit includes coolant container, all necessary fittings, hose and tubing for quick setup on any make of machine.

Write Today for free bulletin and complete facts—or, better yet, send sample order for prompt delivery.

NOTE: CHOICE TERRITORIES AVAILABLE FOR INDUSTRIAL DISTRIBUTORS.

Spra-Kool — THE OPERATOR'S CHOICE FOR DRY GRINDING

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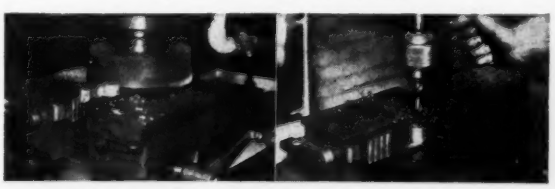

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FREE BULLETIN on SURFACE ROUGHNESS tells . . .

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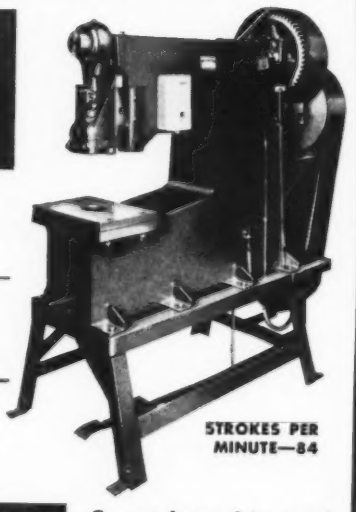

DEPTH OF THROAT—24"

HEIGHT OF THROAT—12"

LENGTH OF STROKE—2½"

STROKES PER MINUTE—84

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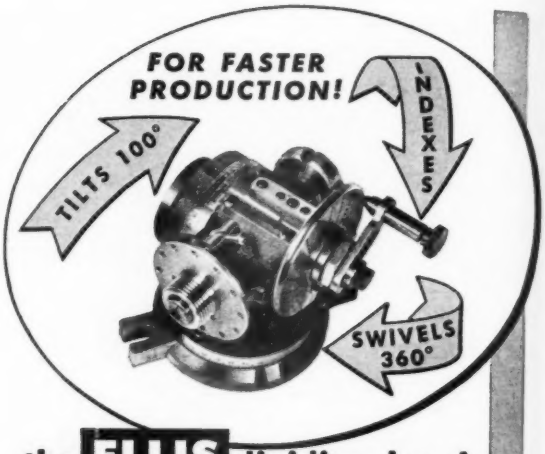

the ELLIS dividing head

Although it is built to fine instrument standards, the ELLIS is a really *rugged* tool room or production tool that's designed for unusual versatility. Its universal motions—swiveling in two planes—will save time and increase profits and accuracy on your millers, grinders, drill presses and jig borers. It has 6½" swing, or 11" swing when used with riser blocks. Work may be held between centers, or in chucks or collets. To save rehandling of work, and to save money, investigate the ELLIS by writing for complete details!

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NICHOLS-MORRIS CORP.

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V-BLOCKS V accuracy of .0005-inch.

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DEALERS IN ALL PRINCIPAL CITIES

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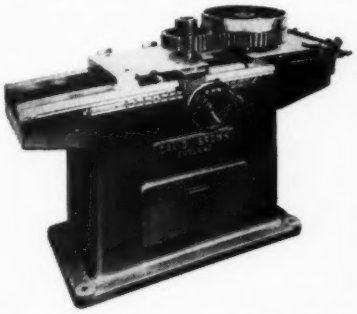
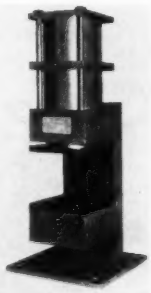
Concentricity, Tooth Contact, Center Distance, and varying tooth thickness of gears up to 24" are rapidly



and positively checked on this David Brown No. 24 gear roll tester. Readings are registered on the dial indicator and center distances are read directly from a vernier scale. It's distributed by Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y.
Circle Inform-A-Gram No. A22.

Well-Oiled Stock will permit 100% to 200% longer runs per sharpening of press dies. The tilting roll stock oiler manufactured by Stamping Specialty is completely self-contained and does not require any lagging to the floor. It's adjustable for heights from 24" to 44" and angle adjustments to 35° are standard. Rolls are 9" wide and oil flow is valve-controlled. Get details from Stamping Specialty Co., 2141 N. Sherman Dr., Indianapolis 18, Ind., or— **Circle Inform-A-Gram No. A23.**

The Massive Ram on the new Vi-Speed air press, P66 Series, provides a maximum of guiding surface for maintaining close tolerances on all pieces, including those held off-center. It features a 6" x 6" platen, 5" piston rod, and 5" cylinder. Van Products Co., 5778 Old Ridge Rd., Swanville, Erie 7, Pa., or —
Circle Inform-A-Gram No. A24.



The New Extension Attachment for the Nord Di-Profiler consists of a flexible rod with ball joint diamond file on the end. Used for honing and finishing pieces that can't well be reached by normal file or finger action, it is mounted to provide reciprocating action adjustable from 0" to ¼" and the ball joint action permits the abrasive face to conform to any contour for which it is designed. Get details from Nord Instrument Corp., 449-T Central Ave., Orange, N. J., or —
Circle Inform-A-Gram No. A25.

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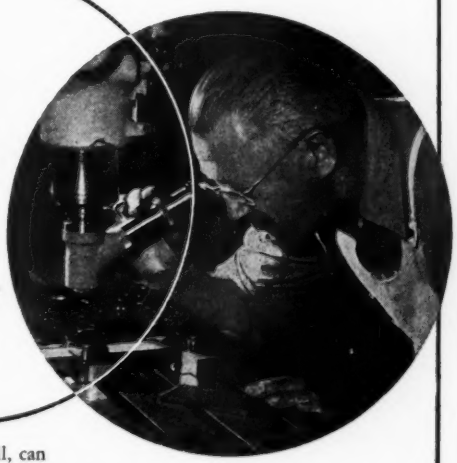
CIRCLE INFORM-A-GRAM KEY NO. 1171

PRECISE hole location, easy contour inspection with *new* machine tool microscope



Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

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Stops Losses
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Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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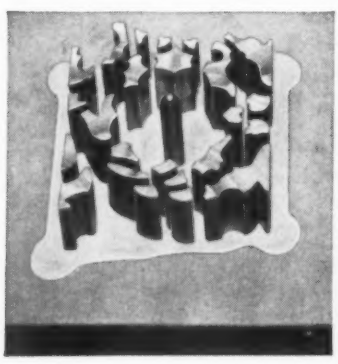

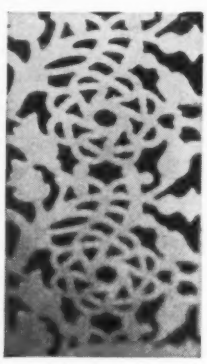

Photos courtesy Stebbins Tool & Die Co.

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ANOTHER skeptical prospect now an enthusiastic customer. *60 hours time saved by using 5 pounds of Cerromatrix* and "The Method" in building this complicated perforating die for .020" thick, half hard brass. Die still in perfect condition after producing over 100,000 pieces. Die made by Stebbins Tool & Die Co., Bronx, for Embassy Metal Products Co., New York.

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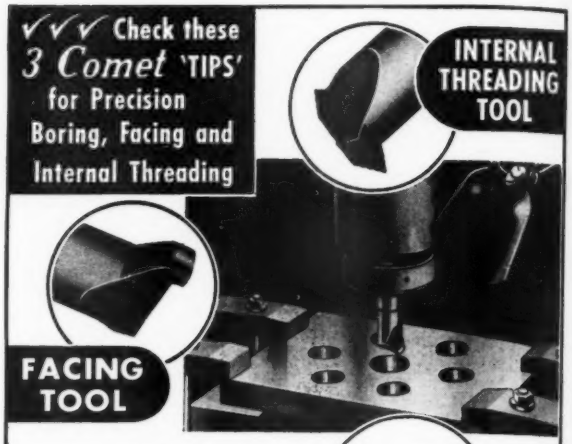

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FOR HOLES FROM 1/16" UPWARD
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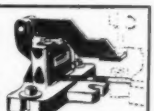
New LOW prices on the JACO 3-inch and 6-inch SCRAP CHOPPER



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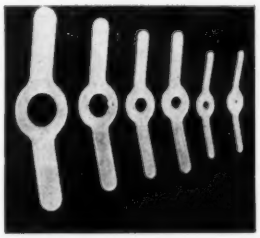
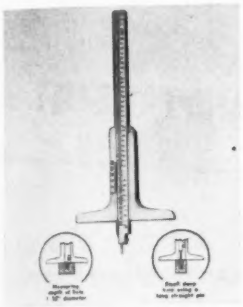
Dealer Inquiries Invited

JACO DEVICES, INC.
96 High Street Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1184

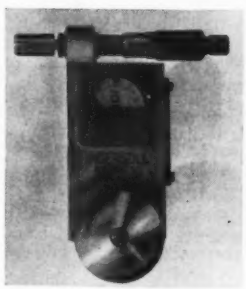
The Double Tail on these new grinder dogs gives each dog the correct balance. This eliminates the override on the down cycle of the rotating dog while driving work held between centers on various grinding operations. Dayton Rogers Mfg. Co., Minneapolis 7, Minn., will supply additional information.
Inform-A-Gram No. A26.





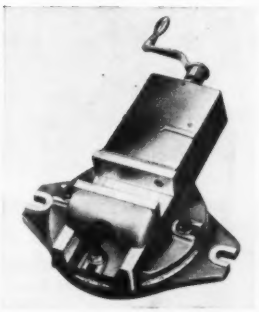
Equipped with a 1/1000" Vernier, these Mauser depth gages fill a long felt need for a fast and direct reading depth gage by scale and vernier. Holes as small as 1/32" dia. are measured with a hardened pin 1/32" dia. Deep holes are checked by replacing the standard pin with a long straight one. George Scherr Co., Inc., 200 Lafayette St., New York 12., or —
Inform-A-Gram No. A27.

A New Swing Clamp Assembly designed for moderate to heavy duty holding power in close quarters is announced by Jergens Tool Specialty Co., 712 E. 163 St., Cleveland, Ohio. It features a spring-loaded shank for speedy clamp release, which in turn permits the assembly to swing quickly out of the way for fast maneuvering of work. The steel forged heat treated assembly body is mounted by simply drilling and tapping a hole.
Inform-A-Gram No. A28.



Alignment of Heavy Machinery, aircraft jigs, and many other kinds of equipment is simplified with the use of the new electric micrometers introduced by The Ingersoll Milling Machine Co., Rockford, Ill. They check vertical alignment and lateral horizontal alignment over substantial distances with readings within 0.0002".
Inform-A-Gram No. A29.

A Complete New Line of highly accurate machine vises, including a quick-operating model, have been introduced by Alina Corp., 401 Broadway, New York 13, N. Y. A specially constructed movable rear jaw slides under the fixed front jaw to allow for extremely accurate clamping, since neither jaw can lift or tilt up.
Inform-A-Gram No. A30.



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Provide accurate positioning for mechanical operations such as

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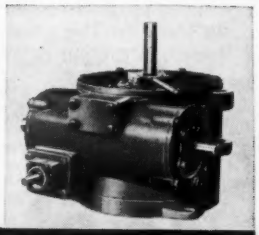

Fully described and illustrated in Bulletin 12

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STANDARD TOOL & MANUFACTURING CO.
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At Buckeye Tools Corp.-

STOCKROOM AREA CUT IN HALF, EFFICIENCY DOUBLED

In redesigning their toolroom to gain additional production space, engineers at Buckeye Tools Corp., Dayton, Ohio, reduced the actual area of the stockroom from 1800 to 900 square feet by using modern Rotabin storage methods for small parts. Each 34"-diameter Rotabin unit holds stock once requiring nine lineal feet of conventional shelving.

A Buckeye engineer comments: "Because of their 12-foot height, the old bins required much climbing in narrow aisles. Now all stock is within easy reach without climbing. Where two men were formerly required to handle the stock, one man is now able to do the job. The production department has put to good use the space gained by this change-over."

Find out, without obligation, how Frick-Gallagher can help you put *more* into *less* space. Write...

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FGM

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ON

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GAGE COMPANY

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ARC-FIT TWIN-NOTCH

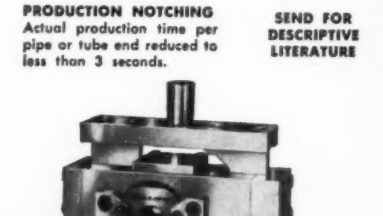
NO DEFORMATION Shears from inside out—cuts clean edges; eliminates need for further finishing; aligns notches automatically.

PERFECT "T" Joints for welding or brazing.

PRODUCTION NOTCHING Actual production time per pipe or tube end reduced to less than 3 seconds.

INTERCHANGEABLE Punches and dies up to 2⅜" O.D. pipe or tube for STANDARD TWIN NOTCH. (Special units available up to 3" O.D.)

SEND FOR DESCRIPTIVE LITERATURE



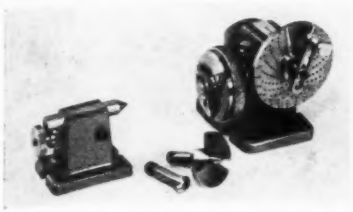
PATENT PENDING

VOGEL TOOL AND DIE CORPORATION

1817 N. 32nd Ave. Melrose Park, Illinois
FIllmore 5-0160

CIRCLE INFORM-A-GRAM KEY NO. 1203

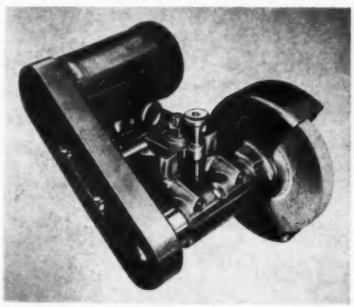
A Versatile Dividing Head with 2½" chuck capacity has been developed by Custom Scientific Instruments, Inc., 541 Devon St., Kearny, N. J., for use with the CSI microscope stage or on any equipment used for profiling, drilling, light milling, layout work, and engraving on



dials, cams, templates, round dies, cylindrical parts, or anything requiring angular setups and circular or semi-circular divisions within its capacity. **Inform-A-Gram No. A31.**

A Wire-Twisting Tool for use in many assembly operations requiring the positioning and twisting of wires is now available from All-Purpose Tool Co., 2046 Utica Ave., Brooklyn, N. Y. "E-Z-Twist" assures a controlled and even twist on wires, with the exact degree of torque desired. Its lock-on action allows the operator to manipulate the wires freely without danger of cutting them.
Circle Inform-A-Gram No. A32.

Convert Any Basic Machine Tool into a precision external grinder with the Series 25 3-hp tool post



grinder from Dumore Precision Tools, Racine, Wis. It's for heavy duty cylindrical and surface grinding and mounts on lathes 20" or larger, planers, shapers, vertical mills, etc.
Circle Inform-A-Gram No. A33.

An Automatic Lubricator for abrasive grinding belts has just been added to the Manzel line of force feed lubricators and chemical feeders. The compact unit consists of an adjustable stroke pump driven by a reciprocating air motor and incorporating a spray control cylinder that triggers the air only when the fluid is being delivered to the spray nozzle. Contact Manzel, 315 Babcock St., Buffalo 10, N. Y.
Circle Inform-A-Gram No. A34.

THE RIGHT TOOL FOR THE JOB IS HALF THE JOB

—An Old Axiom Still True

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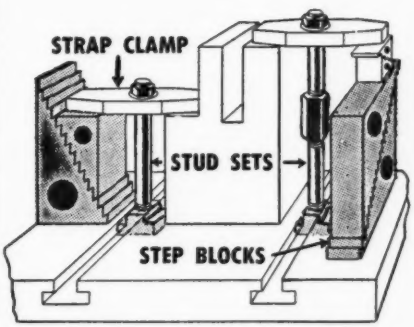

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Clamping tools of all types.

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HARDENED and GROUND HSS BLANKS

Any decimal diameter to ⅝"—in any length.
Mirror finish surface to gage tolerance.
Many uses —
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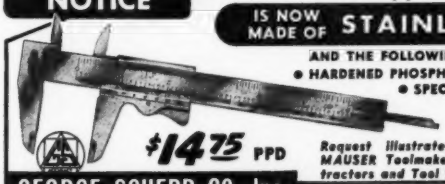
IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIER to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



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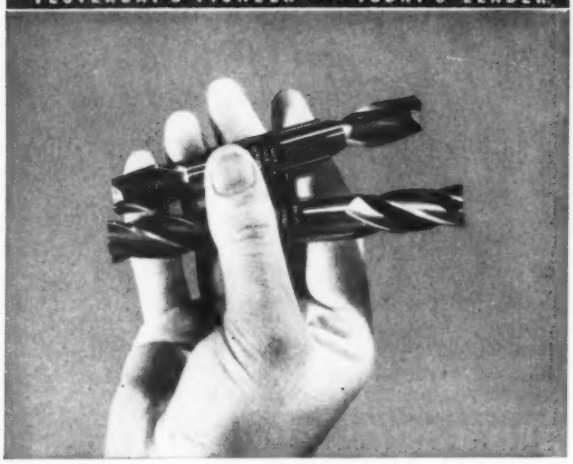
CIRCLE INFORM-A-GRAM KEY NO. 1214

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Double-End End Mills

FOR DOUBLE DUTY

Weldon Double-End End Mills originally developed by Weldon give you double the service for much less than the cost of two single end mills of equal size. They save production time, too, because to change the mill you simply turn it end for end.

Weldon leadership in the cutting tool field has been achieved by many original features which contribute to faster, better performance and longer tool life.

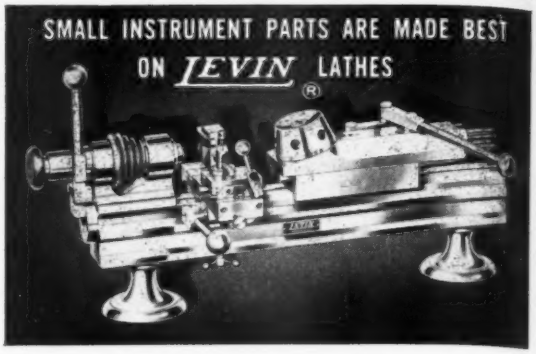
Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

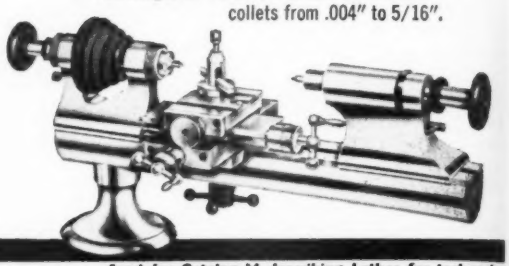
3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1221

SMALL INSTRUMENT PARTS ARE MADE BEST ON *LEVIN*® LATHES



Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



Send for Catalog M describing Lathes for tool work, second operations; turrets and full line of accessories.

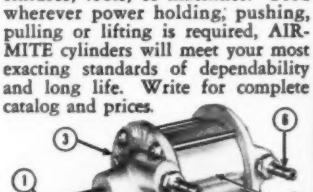
LOUIS LEVIN & SON, INC., 3610 S. BROADWAY, LOS ANGELES 7, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1222

AIR-MITE AIR CYLINDERS

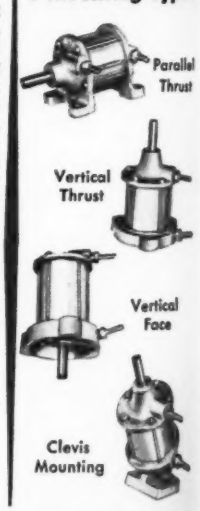
Low Cost . . . Compact . . . Powerful . . . Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel ram
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless ram bushing
5. Five steel tie rods
6. Brass hose stems

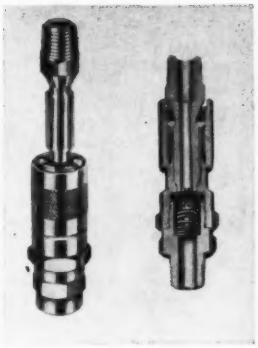
4 Mounting Types



AIR-MITE Devices, Inc.

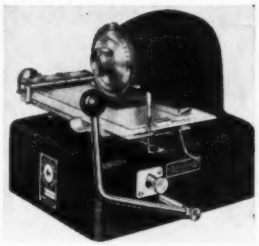
4417 W. CARROLL AVENUE • CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1223

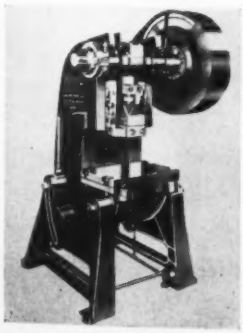


Utilizing a Modified Collet Principle for instant locking and unlocking, this new coupling, when engaged, is free to swivel yet has 80% of the plug shoulder in complete contact with the collet fingers. Its uses range from joining hose ends, metal tubing and pipe, and moisture and vapor tight electrical connections to connecting flexible shaft and rod ends. R. S. Corcoran Co., Box 1404, Joliet, Ill., or —
Inform-A-Gram No. A35.

Go and Not-Go Tests of Recesses and undercuts from 0 to 2" are made with these precision-ground recess pins which are adaptable to present snap gage frames. Recesses as small as 0.072" can be measured with the new hardened and ground alloy steel pins. They're available in sets of four, with each pin individually encased in a plastic vial. Get further information from Products Engineering & Mfg. Co., Dep't Y, Holyoke, Mass., or —
Inform-A-Gram No. A36.

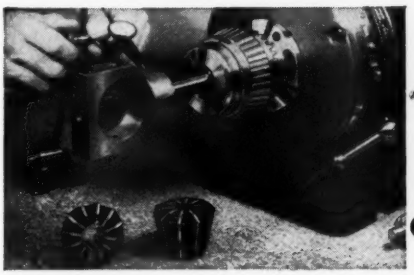


The Self-Aligning Table on this metal marking detail press contains line and tab spacing similar to standard typewriters. Operating time in making tags and nameplates is reduced because no visual alignment is necessary. It accommodates wheels of 39 characters from 1/16" to ¼". Write to Automark Div'n, Defiance Machine & Tool Co., 1921 S. Vandeventer, St. Louis, Mo., or —
Inform-A-Gram No. A37.



Increased Die Life is the result of the specially designed high strength alloy frame and heavy reinforced ribs on this new No. 3½ Press Rite 37-ton press. It has the features of other Press Rite models and standard speed is 120 strokes per min. Sales Service Machine Tool Co., 2363 University Ave., St. Paul 14, Minn., or—
Inform-A-Gram No. A38.

HERE'S A TYPICAL HOLDING JOB



Jacobs RUBBER-FLEX COLLETS

HOW MANY MORE DO YOU HAVE?

Here the new Jacobs Model 96 Rubber-Flex Collet Chuck holds a machined part for inspection.

We don't yet know all the applications for this marvelous holding device. We *do* know it is the most accurate collet chuck in the world . . . that it holds any piece from 1/16" to 1⅜" in diameter using only 11 collets, and has a gripping power unmatched by any split steel collets.

What are your work holding jobs for Model 96? Get the details on this great chuck from your industrial distributor, or write The Jacobs Manufacturing Co., 2607 Jacobs Road, West Hartford 10, Conn. Ask for Bulletin 54-CC.

Jacobs CHUCKS
If it's a Jacobs – it holds

CIRCLE INFORM-A-GRAM KEY NO. 1231

Use CROBALT cast alloy tools!

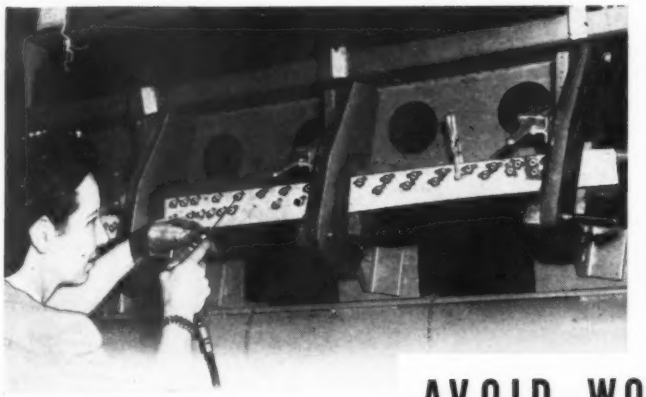
CROBALT cast alloy cutting tools outwear and outproduce HSS . . . withstand shock and vibration far better than carbides . . . give 15% to 35% more pieces per grind than other cast alloys! They've been proven through 23 years in the largest metalworking plants; and today they're better than ever. Try them and see!

FREE CROBALT BULLETIN
describes the conditions where cast alloy tools are BEST — and tells how to use them to full advantage. In it, you may find the way to higher production at lower cost. Write for *Bulletin 101*.

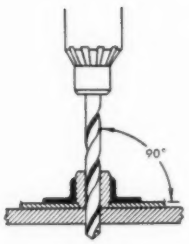
DISTRIBUTORS: We invite your inquiries.

Crobalt, Inc.
2800 S. State St., Ann Arbor 5, Michigan

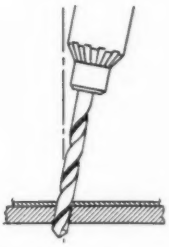
West Coast: 111 Eucalyptus Dr., El Segundo, Calif.
CIRCLE INFORM-A-GRAM KEY NO. 1232



Free hand drilling of perpendicular holes using Anchor Bushing Drill Template at Ryan Aeronautical Co., San Diego.



ANCHOR BUSHING DRILL TEMPLATE — DRILL SUPPORTED AT LOW COST.



UNBUSHED DRILL TEMPLATE FOR LOW VOLUME PRODUCTION — NO DRILL SUPPORT.

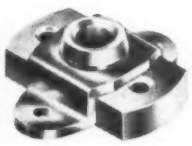
AVOID WORK SPOILAGE—USE ANCHOR BUSHING DRILL TEMPLATES

Rejects threaten when unbushed drill templates are used to replace expensive drill jigs or fixtures on small quantity production runs.

Being low in cost and easy to make, Anchor Bushing drill templates prevent off-perpendicular drilling, inaccuracies of hole location and the use of wrong drill sizes.

Anchor Bushings are riveted or spot-welded to sheet metal, and riveted on or imbedded in laminated plastic materials. These lightweight drill templates can be made flat or in compound curves for a fraction of the cost, time and skill required for drill jigs or fixtures.

Learn how to make low cost, accurate drill tooling — write for the Anchor Bushing Catalog.



NUTPLATE ANCHOR BUSHING

STANDARD ANCHOR BUSHING

hi-shear RIVET TOOL COMPANY

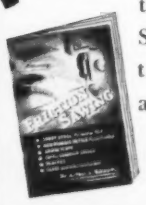
8924 BELLANCA AVE., LOS ANGELES 45, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1241

FRICTION SAWING WITH Tannewitz HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Write for your free copy of "FRICTION SAWING" and get hep to the fact you can save thousands of dollars and much valuable time by friction sawing with Tannewitz High Speed Band Saws: Sheets of both hard and soft steel, formed or flat; trimming of malleable and steel castings; 1" armorplate and other materials. Write for the "FRICTION SAWING BOOKLET", right NOW!



Get your FREE COPY OF "FRICTION SAWING"

GL-6-1729

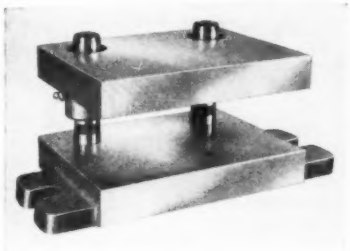
SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1242

Plants Cutting and Grinding Aluminum should be interested in the new stain-free coolant produced by International Chemical Co. It has a high degree of lubricity and detergency and anti-weld properties, and will not discolor aluminum alloys. For further information on Compound 131-A, write to International Chemical Co., Inc., Dep't A60, 2628 N. Mascher St., Philadelphia 33, Pa., or — **Circle No. A39.**

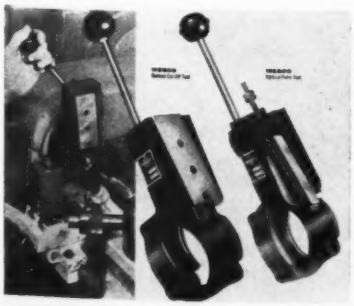
The Straight Rectangular Shape of the Northern die set eliminates costly curved-shape cutting from larger blanks; welded flanges provide adequate clamping area for mounting in a press; and balanced location of posts directly behind the die area



provide maximum die working area for the weight and bulk of the set. Get a catalog from Northern Tool Specialties Co., 21509 McCracken Rd., Cleveland, Ohio, or — **Circle Inform-A-Gram No. A40.**

Economically Replace Hand and Bench Riveting methods on small assemblies with the new G-400 automatic drill-countersink-riveter recently introduced by the Toolset Div'n, General Riveters, Inc., 785 Hertel Ave., Buffalo 7, N. Y. It can be used with all types of work positioners, including those fully automatic tape-controlled. **Circle Inform-A-Gram No. A41.**

These Vertical Lathe Tools are manufactured in two models for cut-off and form work where speed and precision are equally important. Both feature an automatic-return type slide. The cut-off tool holds



standard blades and the form tool, standard ½" tool bits. Wesco Machine Corp., Lathe Tool Div'n, 7536 San Fernando Rd., Sun Valley, Calif., or — **Circle Inform-A-Gram No. A42.**

REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

CAST IRON KNOBS

SCALLOPED PRONG LONG SHANK With Wrench Hexagon

Made in above three types and a wide variety of sizes. Designed to improve appearance of product. Well proportioned with eye appeal. Made of fine grain cast iron. Smooth finish. No sharp edges. Can be supplied drilled and tapped or drilled and reamed when desired. Low prices.

Also

Get our low prices for plastic and steel ball handles, machine handles, compression springs, etc.

FREE! NEW 56 PG. CATALOG

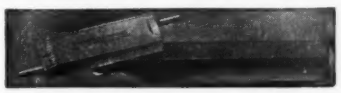
REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1251

THE KOCH TEST INDICATOR

IS THE ONLY TOOL MAKERS INDICATOR ON THE MARKET WITH TWO WORKING ENDS, FOR PRECISION WORK, ONE END TO TEST OUTSIDE SURFACES, THE OTHER INSIDE.

What Every Tool Room, Tool Maker or Machinist Needs.



Plunger moves away from, instead of against the lever, protecting delicate parts from sudden or excessive jolts. Each graduation on scale represents 1/1000" movement of plunger. $10.00 plus postage.

ANDREW GENALES, NYACK, N. Y.

A-28 Second Ave. Dealers Wanted **Tel. Nyack 7-2222**

Ask your dealer for these tools and buy through him. If he cannot furnish them, Write to us.

CIRCLE INFORM-A-GRAM KEY NO. 1252

CENTERLESS DRILL BLANKS

Hardened and Ground High Speed Steel

STANDARD BLANKS: Hardened and centerless ground high speed steel blanks carried in stock for your use. Diameters supplied with tolerance of plus .0002.

SPECIAL BLANKS: requiring special diameters and lengths furnished promptly. Send us complete information. We will quote promptly.

USE FOR: The combination of perfectly hardened and tempered high speed steel produces a tough and hard blank that can be used as PUNCHES, KNOCK-OUT PINS, DOWEL PINS, END-CUTTING TOOLS, GAUGES AND ROLLERS.

Standard Specification Sheets on Request

CENTERLESS PRODUCTS COMPANY

27 VERONA AVENUE NEWARK 4, NEW JERSEY

CIRCLE INFORM-A-GRAM KEY NO. 1253

MOISTURE CONTROL in Compressed Air

If you're having trouble with vapor, water, moisture, oil, rust, dirt, etc. in compressed air, let me tell you how a simple, inexpensive method renders air thoroughly dry, clean. More than a separator, it captures destructive vapor BEFORE it can condense when air cools at points of application. Many plants saving up to $140 per day in spraying, blasting, molding, drying, etc.; ideal for instruments. Write P. S. Becker, Engineer, 5778 Old Ridge Rd., Swanville, Erie 7, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1254

DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

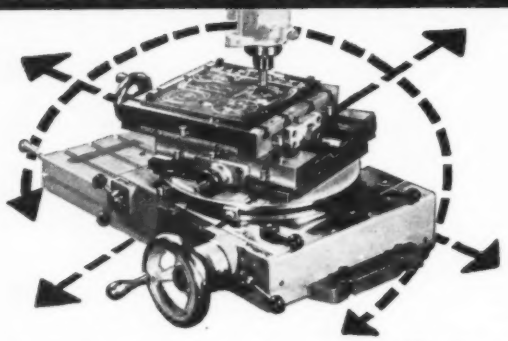
Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS

Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1255

ADVANCE
CROSS-SLIDE ROTARY TABLE



CUT Set-Up Time Cost As Much As **90%***

Make multiple radii and angle milling cuts accurately with only ONE set up! On your standard vertical mill, equipped with ADVANCE Cross-Slide Rotary Table, you can make all such cuts without re-clamping work. Size of radius you can cut is limited only by milling machine table movement. Ideal for molds, dies, patterns, etc.

*Proved by actual on-the-job performance.

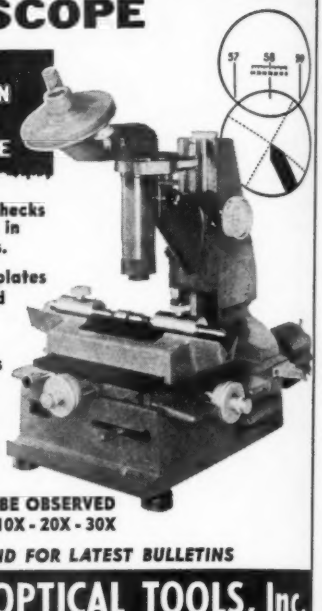
WRITE FOR SPECIFICATIONS, LITERATURE, TODAY.

ADVANCE PRODUCTS / BENTON HARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1261

NEW LEITZ
TOOLMAKER MICROSCOPE

...PRODUCES HIGHEST PRECISION ....CUTS INSPECTION TIME



The NEW LEITZ DESIGN checks angular measurements in degrees and minutes.

Contains all Thread Templates for U. S. National thread profiles 6-80 pitch.

Contains Radii Templates from 21/64" to 13/16" by 1/64". Concentric circles from .010" to .280" by .010" and one blank compartment.

NOTE: TEMPLATES CAN BE OBSERVED IN 3 MAGNIFICATIONS: 10X - 20X - 30X

BE SAFE — SEND FOR LATEST BULLETINS

Geo. SCHERR OPTICAL TOOLS, Inc.

200 -T LAFAYETTE STREET • NEW YORK 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1262

FINE MAGNETIC CHUCKS PRICED UNUSUALLY LOW

Grip work tightly for wet or dry grinding. Guaranteed waterproof. Connections for either 110 or 220 volts D. C.

5¾" x 13" **$63.00**
6½" x 18" **$80.00**
8" x 24" **$156.00**
10¾" x 37" **$296.00**

DEMAGNETIZERS

Instantly demagnetize tools or production parts. No moving parts. 110 volt, 60 cy. A.C.

PLATE-TYPE
MODEL B-2 7¼" x 12½" x 6¼" Ship. wt. 55 lbs. **$78.00**
MODEL J-1 7¼" x 7¼" x 6¼" Ship. wt. 35 lbs. **$54.00**

ROUND TYPE $27.50

RECTIFIERS

A. C. input 110 volts; D. C. output 110 volts. P-1 for 5¾" x 13" chuck 0.8 amps. **$54.00**
P-2 for 6½" x 18" chuck 1.0 amps. **$62.50**
P-3 for 8" x 24", 10¾" x 37" chuck 3.0 amps. **$80.00**

DEMAGNETIZING SWITCHES
For 5¾" x 13" and 6½" x 18" sizes **$12.50**
Field discharge type for 8" x 24" and 10¾" x 37" **$22.00**

Order from your industrial supply distributor or order direct, giving name of your distributor.
IMMEDIATE DELIVERY

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 40 SO. ST. CLAIR ST. TOLEDO 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1263

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

IMPROVED TYPE HOLDERS for stamping into Metal, etc.

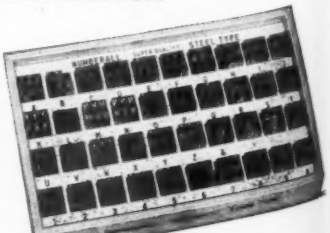
STEEL TYPE

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters.

Write for Bulletin TP23H

TYPE AND TYPE BOX

Indexed Sectional Type Box with separate compartment for each character. Two sizes for small and large type.

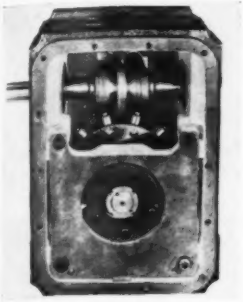


Type Box Bulletin on request.

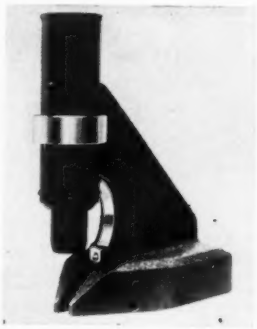
NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

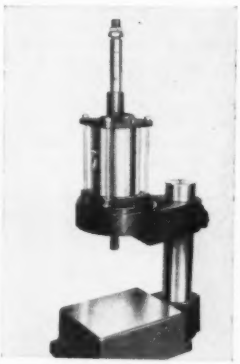
CIRCLE INFORM-A-GRAM KEY NO. 1264

Here is a Cam Indexing Mechanism Designed for inclusion in automatic production machinery employing dial feeds, roll feeds, carriers, and chain or other types of intermittent feeding methods. It permits operating speeds up to 1,000 indexes per min. while maintaining extreme precision without auxiliary locating or locking devices. Eight models of Ferguson drives are now available from stock. Bulletin No. 105A describes the indexing roller drives manufactured by Ferguson Machine & Tool Co., P. O. Box 191, St. Louis 21, Mo. **Inform-A-Gram No. A43.**

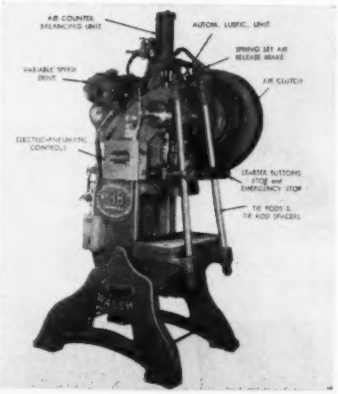


Cross Hairs on the Reticle of this Micro Punch provide an exact sighting point for marking any flat surface for precision drilling. It is particularly useful for prick-punching the intersections of scribed height gage lines and for marking photo-etched templates as used in printed circuitry. Get details from Moran Instrument Corp., 170 E. Orange Grove Ave., Pasadena 3, Calif., or — **Inform-A-Gram No. A44.**





To Meet the Requirements for less "give" in an arbor press for delicate production jobs, the solid steel column is mounted in a newly designed base for greater rigidity. Model CP-12-S is adjustable both vertically and radially and the length of the stroke can be regulated exactly by means of the lock nuts and collars on the upper ram. Mead Specialties Co., Dep't CP-93, 4114 N. Knox Ave., Chicago 41, Ill. **Inform-A-Gram No. A45.**



Tie Rods and tie rod spacers are provided on Air-Clutch Hi-Flex O.B.I. presses so they can be used for precision, lamination, and other high production stampings. Their electric-pneumatic controls may be set in inching, single-stroke, or continuous operation with the possibility of stopping the press at any position. Walsh Press & Die Co., 4709 W. Kinzie St., Chicago 44, Ill., or — **Circle Inform-A-Gram No. A46.**

Now Offers You The

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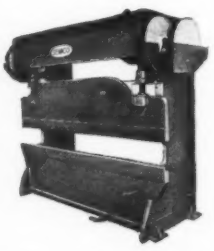

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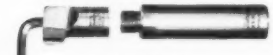

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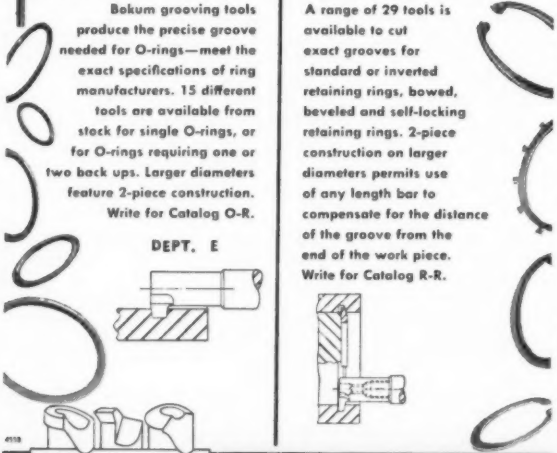

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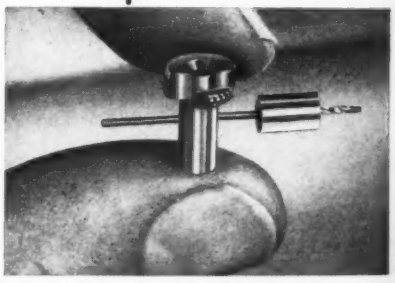

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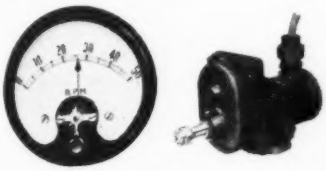
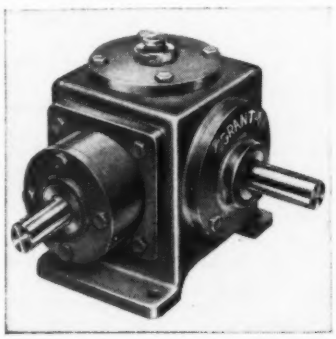


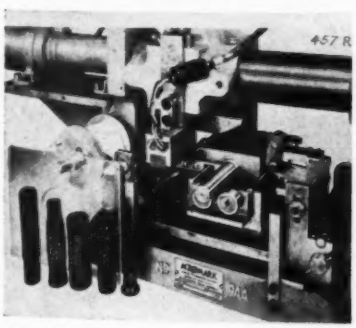
maximum speed has been announced by the Electric Tachometer Corp., 2218 Vine St., Philadelphia 3, Pa. Its magneto may be driven by coupling, gears, or sprockets in such a ratio that maximum speed of its shaft ranges from 10 to 50 rpm. **Circle Inform-A-Gram No. A47.**

A New Right Angle Drive has been added to the line of products of the Grant Gear Works, Inc., 419 Commonwealth Ave., Boston. This Model RA225 miter gear drive is available with a standard ratio of 1-to-1 and furnished up to 2-hp at



1800 rpm. It may be furnished with right-hand, upward, or downward extension, hardened gears, or special ratio. **Inform-A-Gram No. A48.**

A New Fixture for holding plastic, metal, and wood parts for hot or cold mechanical marking combines a



driven rotary mandrel and a set of roller bearing cradle rolls to accomplish the controlled rotation of parts to be marked. Handles, tubular parts, and gages are just a few of the parts the fixture holds. The Acromark Co., 439 Morrell St., Elizabeth 4, N. J., will supply complete details. **Inform-A-Gram No. A49.**

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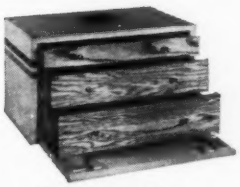

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Catalog 1-67

Our 24-page catalog pictures and describes dozens of magnifiers from folding pocket units to illuminated bench models. It tells you what to look for in selecting one, why a good lens is important, gives prices.

One of our industrial magnifiers may be just the answer to a production or inspection problem in your plant. But which one? That's why we offer to loan you the assortment so you can get the feel of them, see for yourself how well they work, get acquainted with possibilities.

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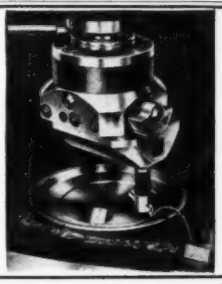

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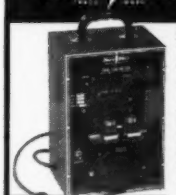
Portable Band Saw Blade Welder
ASSURES PERFECT, UNBREAKABLE WELDS EVERY TIME!
Employs New Vibra-Forge Principle!
BREN-WELD MODEL M ¾" CAPACITY



Built-in grinder removes flash . . . Double gauge checks flat saw widths . . . Butt-welds all saw blades from 1/16" to 3/4". Handles intricate tool and die and power cut-off saws. Additional features of this fully-automatic welder:

- PERFECT WELDS
- NO BREAKAGE
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- WEIGHS ONLY 35 LBS.
- OPERATES ON 110 V, A.C.
- UNCONDITIONALLY GUARANTEED

Size: 7¾" x 12" x 7"
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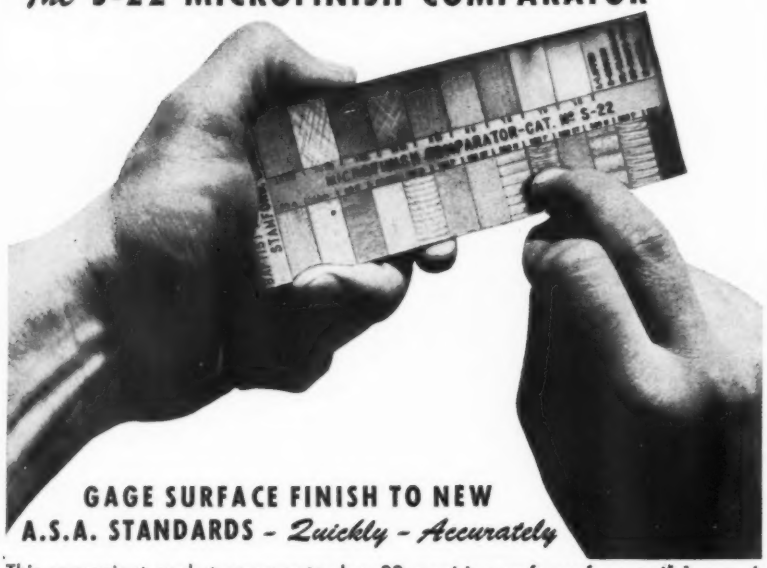
The S-22 MICROFINISH COMPARATOR



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This convenient pocket comparator has 22 precision surfaces for specifying and controlling finish to the new A.S.A. Standard B46.1 - 1955. Electroformed in durable corrosion-resistant nickel, the S-22 Comparator provides every department with the most inexpensive method for uniform, accurate control of finish characteristics.

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1. Unlimited life within borders of permissible loads.
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5. Small constructional height, large deflection.
6. Large inherent damping.
7. Large impact damping especially with multiple stacking.
8. Excellent space disposition.
9. Spring pressure, Spring length and Spring deflection can be easily determined for the same Spring size or can be changed by lengthening or shortening of the Spring columns or by multiple stacking. In special cases the character line can be made to divert from its usual straight form by diversified stacking.
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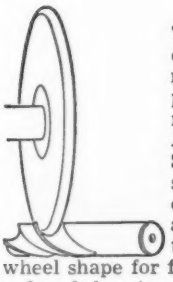
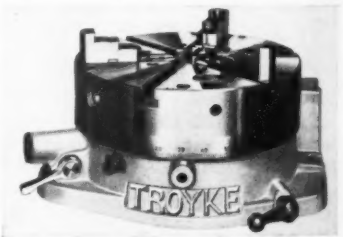


Polish Flutes of Taps and drills faster with the new rubber-bonded flute polishing wheel made by Sandusky Abrasive Wheel Co., Sycamore, Ill. The self-dressing action of the bonded wheel automatically maintains the proper wheel shape for faster polishing and reduced dressing.
Circle Inform-A-Gram No. A50.

Four 6-oz Aerosol Spray-Type Cans of lubricating oil, penetrating oil, rust inhibitor, and all-weather

clear-coat are included in the new Spray Line Utility Kit from Crown Industrial Products Co., 1355 Amsterdam St., Woodstock, Ill. These aerosol products enable operators to spray any of the materials in and around places not ordinarily reached, giving over-all coverage.
Circle Inform-A-Gram No. A51.

The Patented "Roto-Indexer" gives rapid, positive, accurate indexing, taking the place of expensive jigs and fixtures in connection with milling, drilling, jig boring, grinding,



and slotting. Its unique block-out arrangement permits blocking out any or all of its 24 stations. Catalog No. 20 is available from Troyke Mfg. Co., 4422 Appleton St., Cincinnati 9, Ohio. **Inform-A-Gram No. A52.**

Automatic "Airfeedtapper" features controlled thread-cutting for the high-speed production of clean, accurate threads with minimum tap breakage. It has adjustable torque control, a micro-depth adjustment, and adjustable feed rates and uses standard Jacobs chucks or Scully-Jones tap drivers. Catalog Section 93 from Keller Tool Div'n of Gardner-Denver, Grand Haven, Mich., gives information. **Circle No. A53.**

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SERVCO MASTER STAND
No. 1004
24" to 64" height range

Instrument craftsmen designed this stand to permit faster and more accurate set-ups of minimum height Jigs and Fixtures, Machinery Alignment, and Tooling and Production. Provides users of transits, levels and jig collimators with the most accurate, stable, flexible and safe stand ever designed for industry.

HUNDREDS NOW IN USE BECAUSE OF THESE EXCLUSIVE FEATURES:

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Lateral adjustment through 360°
Easy portability
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Precision rigidity
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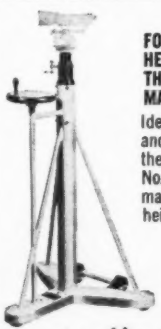

FOR FULL 51" TO 82" HEIGHT RANGE SELECT THE SERVCO NO. 1001 MASTER STAND
Identical in construction and working parts to the Master Stand No. 1004, provides for maximum instrument heights.

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CIRCLE INFORM-A-GRAM KEY NO. 1311

CARBON DIOXIDE IMPROVES INERT-GAS WELDING

by Edward J. Vogel
THE LIQUID CARBONIC CORP.
Chicago, Illinois

*and Daniel F. Zimmerman**
ALLOY PRODUCTS COMPANY
Marion, Indiana

SINCE THE DEVELOPMENT of the first inert-gas welding torch, there has been a constant search for a qualified substitute inerting medium. The most popular shielding gases, argon and helium, have proven themselves rather costly. In addition, availability has posed still another problem.

The basic requirements for an inerting gas are relatively few. It must shield the area from atmospheric contamination, and should not be responsible in itself for any weld contamination. In addition, the gas should be plentiful, safe to handle, and priced as low as possible.

It now appears that carbon dioxide (CO_2) will not only meet the above requirements for a suitable inerting medium, but will add a few contributions of its own. It will effectively provide a shield against atmospheric contamination; it has no detrimental effects on the weld itself; it is plentiful, safe to handle, and is a low cost gas. In addition, it tends to produce stronger and more ductile welds.

The use of CO_2 shielding on the tungsten-arc torch (T.I.G.) requires a special type nozzle arrangement. The conventional torch nozzle will not operate properly with CO_2. Under heat, the carbon and oxygen will tend to dissociate, and the dissociation rate is directly proportional to the amount of heat applied. Due to the extremely high temperatures encountered in the electric arc, one can readily appreciate the rapid dissociation of the CO_2 as it nears the arc stream. Oxygen liberated by this rapid dissociation immediately attacks the tungsten electrode, and a violent oxidation of the electrode takes place. The electrode itself will burn and in turn contaminate the weld.

The ultimate answer to this problem was a concentric dual-nozzle arrangement. The inner

. . . *Continued on page 136*

*Mr. Zimmerman is now associated with Universal Machine Co., Fenton, Mich.

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CIRCLE INFORM-A-GRAM KEY NO. 1312

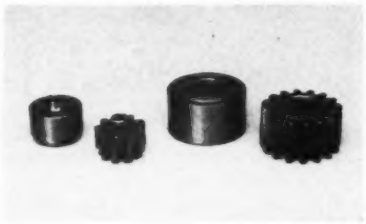
HELICAL EXTERNAL GEARS PRODUCED BY BROACHING

A new process to produce helical external gears by broaching has been developed by General Broach and Engineering Company, Detroit, according to Karl E. Eklund, President.

While General Broach has been broaching straight spur gears for about 10 yrs, Mr. Eklund said, it is believed that the work now being done is the first successful application of broaching to helical external teeth. General applied for patents to cover the process some time ago on the basis of experimental and pilot runs. Recently, several long production runs have been made with complete success.

According to General Broach engineers, the primary advantage of the new method is the extremely low production cost, while accuracy and finish are comparable to that given by other gear production methods. In fact, it is believed that broached gears will run more smoothly because of the complete absence of the minute surface ripples left by the teeth of a hob.

A study of production figures has shown that broaching may cost as little as one-eighth as much as hobbing gear teeth. A recent comparison was made of the cost of tooling-up to produce one of the small helical gears illustrated in quantities of 30,000 per day. To produce the gear by hobbing required an investment of nearly $2,000,000 in machines and tools, while the job could be done for only $70,000 if the gear were to be broached. Subsequent production costs were also considerably less with broaching.



The large initial cost differential was due to the lower cost of broaching machines and the fact that fewer machines were required. In a plant operated by General Broach for gear production, production rates of 20,000 finished gears per day per machine are not uncommon, the figure depending on the specifications of the gear being produced.

Machines are automatically loaded and at least one part is finished at every pass of the broach. Occasionally it has been possible to complete up to eight gears with a single broaching stroke. The tool design is an adaptation of pot-type broaching which allows quick replacement of individual broach teeth. As the blanks pass through the center of the broach, they are guided only by the broach and teeth and need not be center piloted.

The process does not lend itself well to short-run production because of the initial tooling cost. However, General Broach engineers feel that the process should be given consideration whenever total production runs will be 50,000 gears or more.

The CHIP-TOTE conveyor permits complete utilization of machine tools by eliminating shut-down for manual scrap removal.

It handles a continuous flow of hot, wet or dry chips, turnings and borings from any multiple spindle automatic machine.

SPECIAL BROACHES INCREASE OUTPUT DECREASE SCRAP

Ten milling operations as well as finish grinding were specified as necessary to machine an intricate steel portion of a grenade launcher, but these specifications went by the boards when a Detroit ordnance subcontractor substituted two broaching machines to perform the job.

The broaching technique not only doubled production, but reduced scrap 70% and dropped costs 30%. It also eliminated the necessity of tying up nine milling machines which were formerly used to mill the required slots, chamfers and provide the necessary finishes.

The material for this part was AISI-C1141 carbon steel, hardened 20 to 30 Rc, on which a surface finish to within 125 microinches was required.

Formerly the biggest problem was size variation. This necessitated mill adjustments and 100% inspection to keep within government specifications. Production was so slow that another method of machining was sought by the subcontractor.

Acar Broach suggested the use of two broaching machines, estimating a 20% reduction in scrap.

In undertaking the job, Acar Broach tooled up two machines in its own Detroit plant — a horizontal twin-ram 5-ton, 48″ stroke pull broach machine, and a vertical 5-ton, 36″ stroke surface unit. The former was tooled up with a special form broach, the latter with a finishing broach.

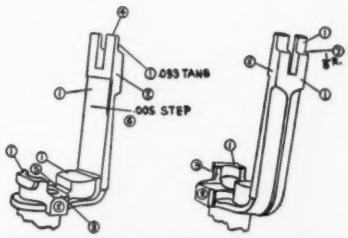
The form broach was designed to cut a slot ¼″ deep by ½″ wide, two 45° chamfers, and one 0.003″ step, all in one pass on one ram. The other ram of the machine was used for straddle broaching operation.

The vertical machine was equipped with a 2-position fixture. This enabled the right-hand ram to do a slab broaching operation, the same broach finishing a pad to 0.001″ tolerance and producing a 0.015″ step. The left-hand position finished a tang to 0.093″ thickness by ½″ long, including an ⅛″ radius.

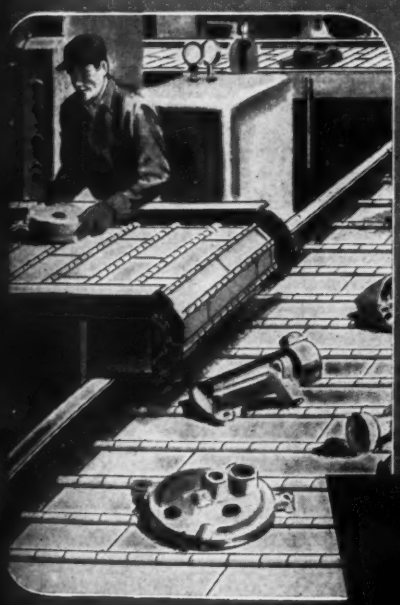
In placing the two machines in production, they stepped up output better than 50%, producing 160 pcs/hr. Scrap was reduced 50% more than estimated, and per-piece costs dropped almost a third.

The savings came from combining the operations, also from the special fixture which simplified work positioning, and accurately locating the work in relation to the broaches, thereby reducing the possibility of errors.

Elimination of operator errors transformed inspection from a piece-by-piece procedure formerly necessary to an occasional spot checking.



Two-sketch view of upper portion of grenade launcher. Two broaches did job of 10 milling operations to achieve volume production. Operations: 1, slab or surface; 2, straddle; 3, slot; 4, trim; 5, chamfer; 6, step; 7, radius.



Now is the time to put AUTOMATION to work . . . Now is the time to cut production costs . . . May-Fran engineers design and build complete scrap handling systems for the automatic removal of machine turnings or chips. May-Fran conveyors will transmit scrap to ultimate point of disposal.

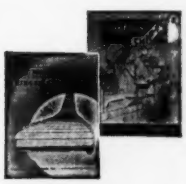
Press Scrap systems can be made completely automatic. Hinged-steel belt will take scrap from presses, handle it through blanking, shearing, forming and baling processes, and deliver it to rail cars.

May-Fran is prepared to engineer, fabricate and install complete conveyor systems to your specifications.

Write today for complete information on how an automatic scrap removal system will cut your production costs.

Bulletin MF-530 describes the new Hinged-Steel conveyor belt.

Bulletin MF-640 describes the Chip-Tote conveyor which removes scrap from operating machines.



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Hinged-steel belting handles scrap as well as hot heavy and abrasive castings. Belt is economical . . . maintenance-free.

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CIRCLE INFORM-A-GRAM KEY NO. 1331

which of these
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PROBLEMS
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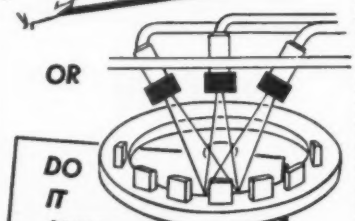
CHECK*

- ☐ Reduction of belt sanding stages
- ☐ Cutting down buffing time
- ☐ Reduction of hand polishing
- ☐ Blending directional grind lines
- ☐ Lowering micro-inch finishes
- ☐ Exposing cracks and fractures
- ☐ Smoothing belt marks
- ☐ Imparting non-directional finishes
- ☐ Semi-reflective surfacing
- ☐ Blending brush marks
- ☐ Surface uniformity
- ☐ Removal of stress marks
- ☐ Obliterating
  - ☐ Scores ☐ Tool marks
  - ☐ Reliefs ☐ Chatter
  - ☐ Pits ☐ Scratches
- ☐ Matte finishing
- ☐ Thread fit and turnability

OR



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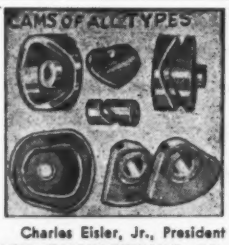
A versatile, low cost, deep throat contour saw, intended for use in the tool room or for light production work, has been added to the popular line of contour saws built by The DoAll Company, Des Plaines, Ill.

The 30" throat depth affords added utility for sheet metal and pattern shops; fabricating, heating and air conditioning equipment manufacturers and light manufacturing operations.

Features incorporated in the machine design permit use of numerous attachments for adapting the machine to a variety of applications. In all, 20 different attachments equip the machine for standard contour sawing, filing, polishing, carbide tool finishing, and specialized operations of many kinds.

The frame is heavy gauge steel of welded box construction. A heavy trunnion and cradle support a husky 24" x 24" work table assuring the rigidity and area needed for handling heavy or large pieces. The table tilts 45° to right and 10° to left. The saw blade welder handles blades up to ½" width for welding and annealing.

CAMS



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Charles Eisler, Jr., President
EISLER ENGINEERING CO., INC.
732 So. 13th St., Newark 3, N. J., U. S. A.

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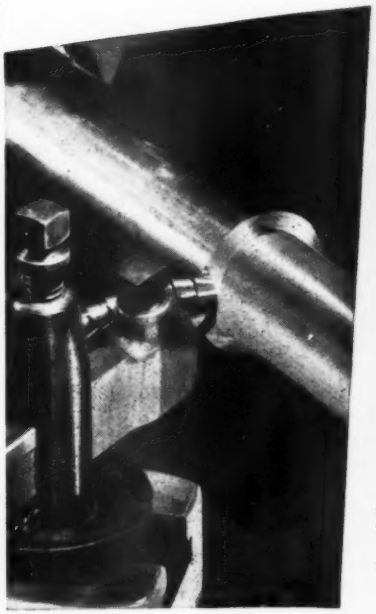

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Turning to South Bend for precision lathes has been the turning point for better values for manufacturers.

These dependable lathes are specifically designed and built for the efficient machining of metals. Their accuracy will save time and material on precision work, especially when tolerances are exceedingly close. Remember, too, that in these versatile lathes you get quality materials and workmanship assuring long, dependable service. They represent maximum lathe value per dollar of cost.

Write for catalog describing 9", 10", 13", 14½", 16" and 16-24" swing lathes. Also ½" and 1" collet turret lathes.

Building Better Tools Since 1906
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16" x 6' Toolroom Lathe
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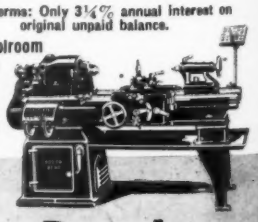

South Bend Lathes

CIRCLE INFORM-A-GRAM KEY NO. 1343

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HOPPER-FED
Headless
SET SCREWS

10 TIMES FASTER APPLICATION

Can be used for practically any set screw application. We offer special mechanism* for applying Headless Set Screws.

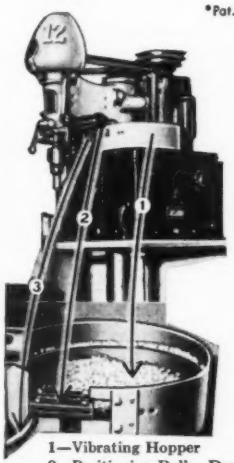
Offers many unusual advantages:

Automatically inspects diameter; rejects misfits.

Takes less floor space; permits smaller inventory, faster delivery.

Reduces floor loss, cross-threading etc.

*Pat. Pend.



1—Vibrating Hopper
2—Positioning Roller Device
3—Tube leading to job

Get details of demonstration at our plant. No obligation. Don't bother to write a letter. Simply jot your name and address in margin of page and mail to us. Also ask for New Set Screw Catalog.

Set Screw & Mfg. Co.
158 Main St. Bartlett, Ill. (Chicago suburb)

We specialize in Solving Puzzling Set Screw Problems

CIRCLE INFORM-A-GRAM KEY NO. 1351

VERSATILE ANODIZING RACK

The common practice usually followed in anodizing aluminum and magnesium alloys makes it necessary to provide racks that fit the dimensions of a particular job. This results in an expensive stockpiling of racks with limited future use.

To meet this stockpiling problem, Sidney Levine and George J. Essoff of the Materials Branch at the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Virginia, have developed a versatile rack for anodizing aluminum and magnesium alloys. It is made of aluminum 62S and pure titanium and will accommodate jobs ordinarily requiring racks of a wide variety of sizes and shapes.

The rack features mobile contact points made up of separate and complete units, so that they can be moved along a track to the desired dimension and set by means of a locknut to provide effective electrical contact.

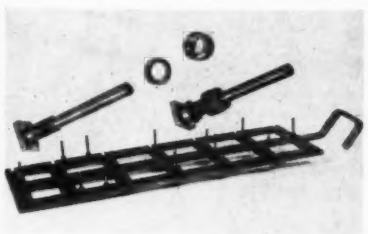
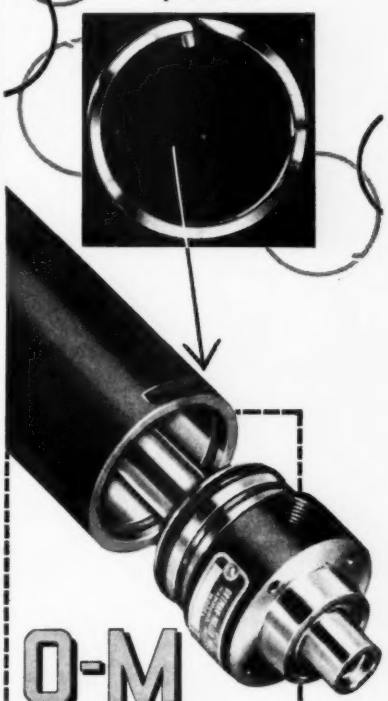


Fig. 1. The rack features provision for attaching mobile contact points in the form of tracks or T-shaped grooves that run lengthwise and crosswise. The parts that make up the contact points are shown disassembled but placed in the position in which they go together. The assembled contact points are also shown as they can be positioned in the tracks of the rack.

Substantial savings have been realized in money, time, materials and storage space by the use of three 6½" x 25" racks at the laboratories. The three racks facilitated anodizing jobs which would have ordinarily required as many as 60 racks of different dimensions.

Fig. 2. This view shows how the rack can be loaded with various-shaped pieces of metal.

faster dis-assembly
no re-alignment problems



O-M has the KEY to simpler cylinder maintenance

O-M Cylinders save down-time expense and headaches when it comes time to replace packing and seals. SPECIAL INTERNAL-LOCKING KEY is released by rotating end cover, which allows quick, easy removal of cover and rod. And re-assembly is fool-proof. There's only one way to take an O-M Cylinder apart, one way to put it together. Key controls positioning . . . locks cover securely. No threads to strip. No tie rods and end caps to bolt together. No time-consuming alignment and adjustment problems.

O-M Air and Hydraulic Cylinders are available in a complete range of sizes (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. *Immediate delivery on many sizes.*

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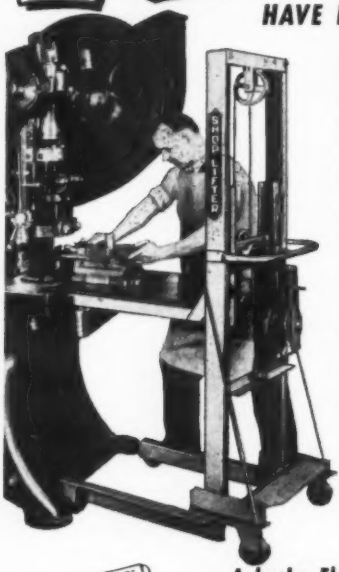
CIRCLE INFORM-A-GRAM KEY NO. 1352

2 Economy LIFTERS

EVERY TOOL AND DIE ROOM SHOULD HAVE FOR FAST, SAFE, HANDLING OF DIES



SHOPLIFTER

Use the SHOPLIFTER to avoid risk of painful accidents and to protect costly dies. Transport dies from storage area to press. To move dies in and out of press. Use it as an adjustable height bench for working on dies.

Platform lift 4'6", high enough for all press beds, yet overall height will clear any standard doorway.

Width 24". Moves easily between machines —in confined areas.

Spur gear hoist unit — most efficient hoist mechanism — lifts capacity load with only 20# crank pressure.

Friction disc clutch holds load securely — automatically.

Big safety factor for occasional overloading when necessary.

Three capacities to choose from

Type D (illustrated) 500 lbs. capacity	$183.60
Type DX—1000 lbs. capacity	350.00
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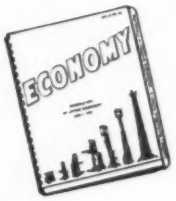
ELEVATING TABLE



A husky Elevating Die Table, with big overload safety factor. Use as work bench at each machine.

Dimension 24"x36". Use it for small, medium and large dies. Capacity 2,000 lbs.

GREATER LIFTING RANGE

24" minimum to 42" maximum height. Wheels under base-frame—you can get up tight against press or rack.

Four crank studs—two at each end of table for high and low speed adjustment.

Roller bearings in wheels and casters for easy moving.

Floor lock holds table securely when moving DIES on and off.

Price $215.00 F.O.B. Chicago.

Write for New Economy Catalog 55 describing all Economy standard products, special engineered overhead service lifters, and material handling machines.

Available from your local supplier

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CIRCLE INFORM-A-GRAM KEY NO. 1361

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Invest in lifetime accuracy with this HARDENED STAINLESS STEEL super caliper. Wide, hand-fitted Vernier slide is smooth operating, easy to read. English or English & Metric graduations. Sizes from 7" thru 20" measuring capacity. In rich wood contour case.

Ask your dealer, or write

ALINA CORPORATION • 401 Broadway, New York 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1362

. . . Inert-Gas Welding, from page 131

nozzle passes a mon-atomic gas (such as argon) which acts as a shield around the glowing tungsten electrode. This shield prevents any electrode oxidation due to breakdown of the CO_2. The outer nozzle passes the CO_2 which makes up the bulk of the weld shield. Figure 1 shows the gas flow pattern obtained.

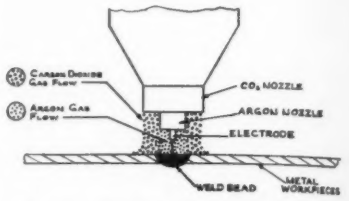


Fig. 1. Gas flow pattern for T.I.G. welding, with carbon dioxide and argon shielding.

Applications of Dual-Gas Torch

To date, excellent welds using this process have been made on stainless and carbon steels. This report, however, shall concentrate on experimental data featuring stainless steels and closely related alloys.

Both the 300 and 400 series of stainless steels were used for test welds. Also included were such materials as Inconel, Nimonic, and Timken. All test welds were made in accordance with established methods and techniques. The only variations made were in the shielding gas flows. Test samples were selected at random and processed as indicated. Straight argon-shielded welds were used as a comparison.

From these tests, it was determined that CO_2 shielded welds are as good and in some cases far superior to straight argon-shielded welds. The initial test welds were all made using a hand-held

. . . *Continued on page 140*

JIG BORING

and

Large Precision Machining

Done to your specifications

14 Jig Borers We Have

KIDDE PRECISION TOOL CORPORATION

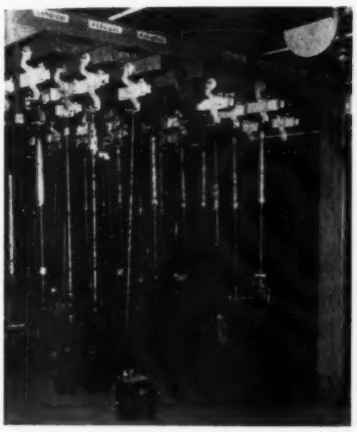
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1363

Key numbers 1371 and 1372 on this page are to be used by Ohio inquirers only.

TROLLEY HANGERS MOVE ASSEMBLIES IN MINIMUM TIME

Among the many assembly operations at Autocar that have been improved within the last year is the handling of steering assemblies. Like most of Autocar's incoming parts and materials, the assemblies come to the plant in pallets—about 15 to a pallet.



As the cumbersome steering assemblies are inspected and final adjusted, they are lifted from the bench to an overhead conveying system. This consists of a bank of steel I-beams leading from the final adjustment bank to the appropriate station on the assembly line. Each assembly is hung from a trolley hanger suspended from one of the I-beams. The rack holds 120 steering assemblies, considered to be an adequate reserve to assure continuous supply for the line. Assemblies occupy a minimum of space and are easily removed.

This is but one of numerous techniques initiated at Autocar's plant in Exton, Pennsylvania since The White Motor Company bought Autocar little more than a year ago.

BIG BIGGER BIGGEST

another FLAME HARDENING *Problem Solved at* LAKESIDE

PROBLEM: To apply controlled, selective surface hardening to a rolling mill roll of 4,200 lbs., 8 feet, 2 inches long and 16 inches in diameter.

SOLUTION: Lakeside's Denver Universal Flame Hardener handles rolls up to 18 inches in diameter and 10 feet long, using a combination vertical and spinning motion, through scientifically controlled, multiple gas jet flames, to apply hardness to a uniform depth without appreciable distortion or scaling. **PLUS** — Lakeside's complete, modern material handling facilities to "baby" the giant roll through every step of its processing.

Our Services:

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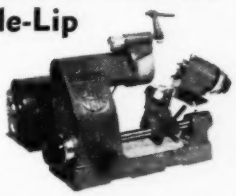
ALEXANDER Grinders for Single-Lip Cutters



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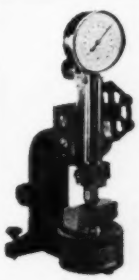

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NON-SCALING COMPOUND
MAKES TROUBLE-FREE HEAT TREATING AS EASY AS A B C

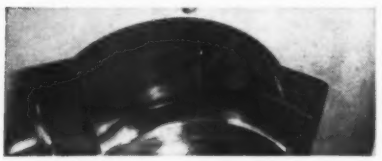
A quick coating of this dry, easily handled powder and the piece is ready for the furnace.

Begin to harden or anneal piece as usual. Phoenix Brand Non-Scaling Compound forms a protective coating—completely sealing out air.

Coating comes off quickly, easily after treating. If necessary, boil in plain water to remove.

END SCALE, PITTING, DECARBURIZATION LIKE THIS

GET BRIGHT, CLEAN FINISHES LIKE THIS—VIRTUALLY ELIMINATING POLISHING, GRINDING AND REJECTS!



Discover the time saving, money saving benefits of Phoenix Brand Non-Scaling Compound—order a trial supply *today!*

2 lb. can $6.00
5 lb. can $15.00
15 lb. can $41.25
25 lbs. or more . . $2.50 per lb.

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THE PARKER STAMP WORKS, Inc.
ESTABLISHED 1871
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CIRCLE INFORM-A-GRAM KEY NO. 1381

A New Approach to Close Tolerance Boring

In any close tolerance boring operation the finish sizing consumes almost 75% of the operators time. In production boring, keeping the tool cutting within the tolerance drift has always been extremely frustrating and time consuming whenever an adjustment had to be made. Most shop men have been acutely aware of the limitations in speed and accuracy, but still have had to treat the problem on a "hit or miss" basis.

The Sterling Engine Company of Buffalo was faced with such a problem. Working on a production run of a large aluminum casting for a radar unit a number of holes had to be bored and held to a plus 0.0002" tolerance. Several types of boring bars and offset boring heads were used, but the problem was not solved, as they still were faced with making adjustments of tenths of a thousandth. At this point adjustments of 0.0001" became a time consuming factor, because of the limited control even a highly skilled operator has over his tool bit, when making corrections using the conventional type of boring tools. Equally important was the fact that as the job progressed, the psychological effect on the operator was to make him more cautious with each successive hole, realizing that any error at this point would prove very costly.

Fig. 1. This illustrates the Deka-Bore model A-2 offset boring head.

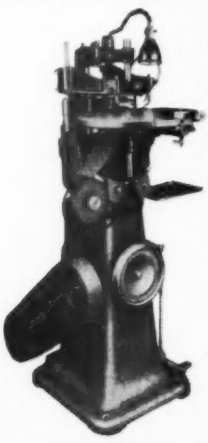
FIGHT HIGH PRODUCTION COSTS! ECONOMIZE with OLIVER DIE MAKING MACHINES

High and unnecessary die making costs will be eliminated . . . production schedules and higher product standards maintained . . . when you equip your toolroom with OLIVER DIE MAKING MACHINES. With an Oliver in your service, smoother production will be assured . . . higher output certain . . . lower die making costs a fact!

OLIVER DIE MAKERS are ECONOMICAL . . . they save you time . . . are easy to operate . . . do not require skilled labor. Many plants have been using Olivers for more than 30 years because they produce dies with more economical results.

OLIVER DIE MAKERS are EFFICIENT . . . prove themselves every day in more than 10,000 installations around the world by consistently effecting cost reductions of as much as 60% through simplifying sawing, filing and lapping operations.

OLIVER DIE MAKERS are ACCURATE . . . engineered, designed and built by Oliver of Adrian, the precision-made Olivers have been tried and tested for four decades. Unsurpassed for accuracy on Dies, Production Filing, Experimental work, Metal Patterns, Cams, Gages and Templates, OLIVER DIE MAKERS are considered essential wherever precision work is constantly required.



OLIVER DIE MAKERS
Available in 5 Models

The Bench Model 5-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
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OLIVER INSTRUMENT CO.
1436 E. MAUMEE . ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1382

Deka-Bore Holds Diameters To 0.0002" Tolerance

In an effort to solve this problem, Sterling Engine turned to the Deka-Bore offset boring head designed and manufactured by the Precision Tool & Mfg. Co., 1305 South Laramie, Chicago 50, Ill. After 200 hrs of using this head it was the consensus of opinion that without this unit the problem of making 0.0001" adjustments would be practically impossible to solve. With the Deka-Bore offset boring head, it has been possible to hold diameters on holes ranging from ½" to 5" in aluminum to 0.0002" tolerance.

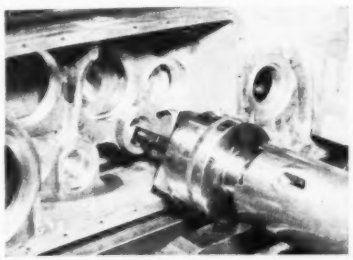


Fig. 2. In a special air conditioned room, this Deka-Bore is used to bore to tolerances as low as 0.0003" on both bore diameter and center distances in aluminum castings.

In this particular setup the Deka-Bore was used on a Giddings & Lewis Type 350T horizontal boring mill in an air conditioned room. However, the Deka-Bore is adaptable to all types of boring applications.

Operator Has Infinite Control Over Tool Bit

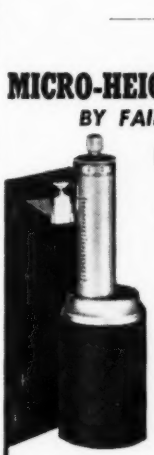
The Deka-Bore is designed to give the operator infinite control over the tool bit, thus giving him the same accuracy at the actual point of contact as is built into the ways and spindle of the machine.

Fig. 3. Closeup of Deka-Bore used to bore to tolerances of 0.0003" at Sterling Engine Co.

This is accomplished by having two independent means of adjustment: The conventional micrometer screw that activates the dovetail slide in increments of one thousandth, and the new Deka-Dial adjustment. The unique feature of the Deka-Dial is that it permits a positive 0.001" adjustment on the diameter. The fact that it is not a screw, vernier or scroll eliminates any possibility of backlash or loss of position prevalent in any conventional type of adjustment. This adjustment will repeat consistently. The dial itself is calibrated in 0.0001" increments over a span of 0.003", although the adjustment is actually infinite. The tenths graduations being spaced 0.072" apart can easily be read with the naked eye. The larger model has the same features over a range of 0.006".

The extreme rigidity required for this type of work is achieved by carefully fitted parts, and the pre-determined spring tension on the gib and dovetail slide.

MICRO-HEIGHT GAUGE
BY FAIRFIELD GAUGE CO.



NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

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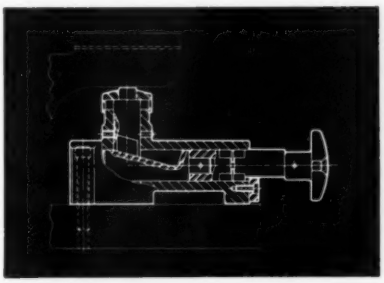
Lower Cost Greater Speed

Why go through the costly motions of making your own jig and fixture parts? **Lodding** mass-produced line is as handy as your nearest Lodding distributor —in all industrial centers— to meet your every need.



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THE STANDARD LINE OF JIG AND FIXTURE COMPONENTS

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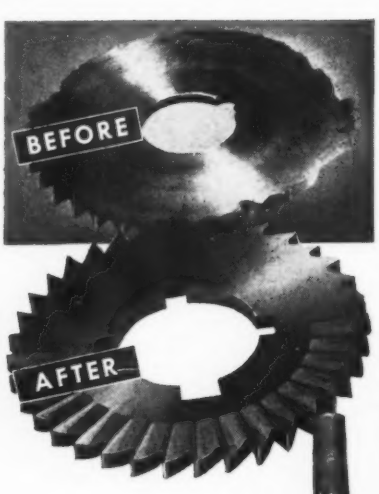

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Longer useful life from cutting tools is one of the logical and proven ways for shops to economize.

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6511 EPWORTH BOULEVARD
DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1401

. . . Inert-Gas Welding, from page 136

tungsten inert gas torch. Identical data has since been established using an automatic tungsten inert gas torch with equally successful results.

Figure 2 is a photomicrograph of a weld section made on 321 stainless steel. The reader will note the excellent uniform grain structure obtained in the weld bead area at the top.

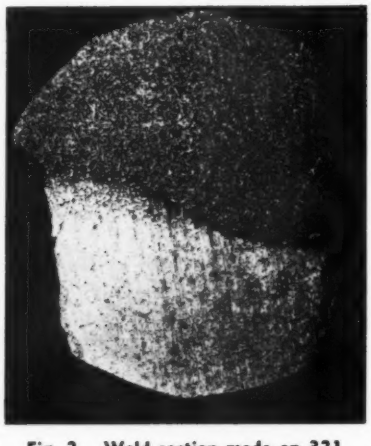

Fig. 2. Weld section made on 321 stainless steel, revealing excellent uniform grain structure.

Carbon Dioxide as a Back-Up Gas

CO_2 has been used with success as a weld backing medium. Its correct use, however, requires the proper handling of gas flows and proper fixture design. The amount of gas used in weld back-up has much more influence on weld appearance than either argon or helium. Specifically, the factors controlling weld quality are the width and depth of back-up groove, gas feed holes and their spacing, and the quantity of CO_2 used.

Basically, gas flows should be kept at a minimum. Use only enough gas so as to completely purge the underside of the weld

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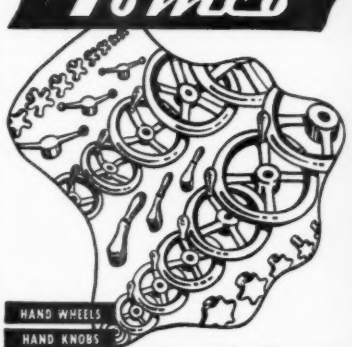

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4312 East 49th St., Cleveland 25, Ohio

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area of atmospheric air. Excessive flows should be avoided at all times. Back-up fixtures with shallow backing grooves are a basic requirement.

Editor's Note: A study of test data indicates that gas flows required with CO_2 shielding are considerably less than those used in conventional argon or helium shielding. In a typical application normally demanding an argon flow of 12 cu ft/hr for arc speed of 8-10 ipm, the use of the dual nozzle would require an argon flow of only 3 cu ft/hr and a CO_2 flow of 9 cu ft/hr. Assuming the cost of argon to be $ .08/cu ft and CO_2 to be $ .01/cu ft, the total gas cost of using argon alone would be $ .96/hr as compared with $ .33/hr for using both argon and CO_2.

Metal-Arc Inert Application

The use of CO_2 in metal-arc inert-gas welding promises a revolutionary approach. Research, to date, has produced some very successful welds with substantial cost reductions. From all indications, CO_2 will ultimately replace present inerting mediums 100% in M.I.G. operations on steel. X-ray and tensile tests have, thus far, revealed sound, quality welds with minimum spatter on mild semi-killed steels. While this phase of CO_2 welding is in its infancy, the very near future should reveal 100% carbon dioxide shielding a reality.

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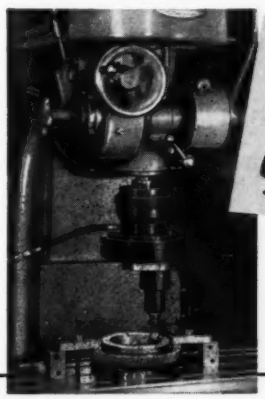
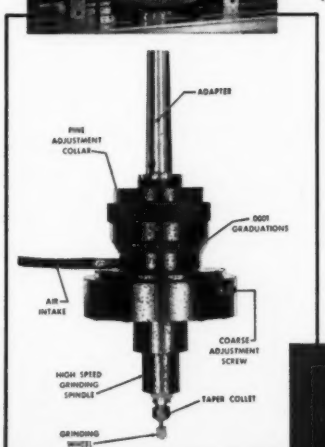


Grind Precision Holes *without* STOPPING the SPINDLE



You can save a lot of time in precision grinding with Grind-A-Matic, the new air-driven head. Unlike other comparable units, radial feed may be increased in increments of .0001" as grinding proceeds. You don't have to stop the spindle every time. Just turn the adjustment collar.

Used as a tool in any jig bore, boring mill, lathe or vertical mill, it gives you high production with the precision of a jig grinder.

Grind-A-Matic grinds holes ⅛ to 2½ inches in diameter with standard equipment. An auxiliary mounting arm increases this range to 4 inches.

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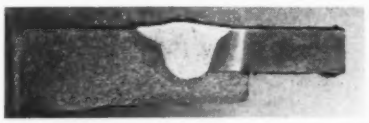
CIRCLE INFORM-A-GRAM KEY NO. 1421

AUTOMATIC WELDING OF LOW AND MEDIUM CARBON STEELS

Automatic equipment designed specifically to use low-cost carbon dioxide gas for shielding the arc in welding mild and medium carbon steel, has been announced by the A. O. Smith Corporation, Milwaukee 1, Wisconsin.

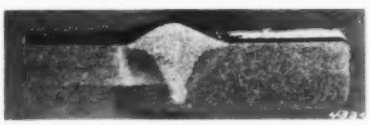
The new C-OMATIC metal-arc welding process will provide low-cost automatic welding plus the benefit of a visible arc, which enables the welder to properly locate the arc in the welding groove and observe the weld metal being deposited.

Not only is CO_2 lower in cost than argon or helium; tests have shown that X-ray quality welds can be obtained with 30 cu ft/hr of CO_2, while 60 of argon or 70 of helium would be required for the same results.



Weld made with CO_2 Gas for Shielding.

Welds made with CO_2 shielding have a wide and well rounded bead penetration, which assures complete fusion and provides better liberation of gases from the molten puddle.

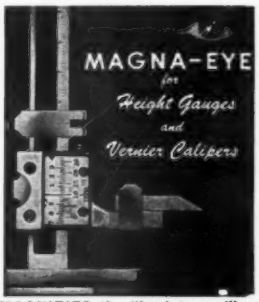


Weld made with Argon Gas for Shielding.

The cleanliness of the weld eliminates slag removal and possible slag entrapment in the weld. The process also eliminates abrasive powdered flux in the area of the weld operation, thus averting another cleanup operation.

The welding head designed for this process is a simple, rugged unit. A special filler wire is fed to the head by means of rollers, a motor drive giving easy selection of wire feed speeds. The nozzle on the head is of simple, rugged design and consists primarily of a contact tube, water-cooled jacket, and a gas-shielding jacket. The nozzle provides a shield of gas around the wire the full length of the contact tube, minimizing the tendency to draw air into the arc.

The C-OMATIC automatic welding head is remotely controlled by operator.



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MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 3 No. 100 for 6" Vernier Calipers; 3 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 3 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.
For Complete Information Write, Phone or Wire
STEBAR COMPANY
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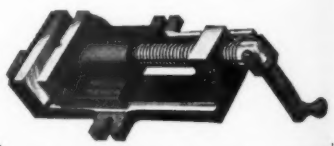

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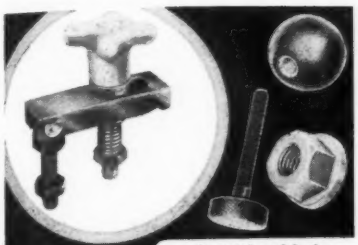

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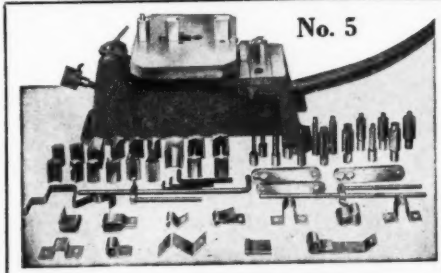

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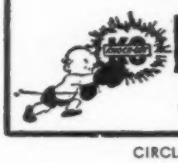

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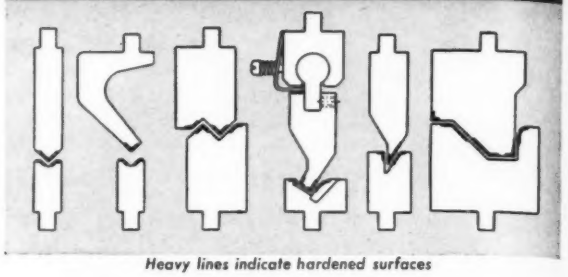

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on any make press brake

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AUTOMATIC GEAR INSPECTION AND MACHINE CONTROL

A new concept in the inspection of gears and the control of hobbing machines has been originated by the development of an automatic gear gage built by Airborne Instruments Laboratory, Inc., 1600 Old Country Road, Mineola, N. Y.

Known as the AIL's Type 80 Automatic Gear Gage, it automatically sorts gears according to production tolerance limits and permits control of the hobbing machine so as to prevent the production of scrap and reduce manufacturing costs.

Each gage is custom-designed to customer requirements thereby sorting gears to his established tolerances at a rate up to 1000 gears/hr. Automatic indicators signal when the pitch falls outside allowable limits, also indicating when the hob has begun to dull. An automatic circuit removes power from the hobbing machine if it produces too many gears outside the tolerance limits.

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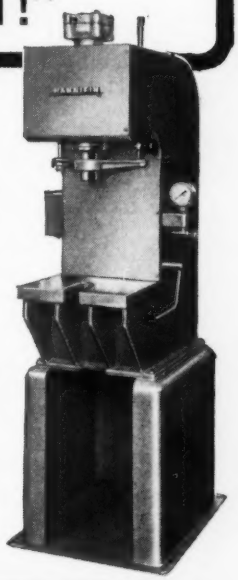
"BEST $1286 WE EVER SPENT!"



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A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

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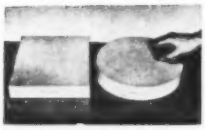

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CIRCLE INFORM-A-GRAM KEY NO. 1462

DIAMOND SAVINGS MADE WITH NEW MOUNTING METHOD

A method of mounting stones in diamond tools, providing crystal savings of up to 90%, has been developed by Dr. H. Tracy Hall. Hall was a member of the G-E Research Laboratory team responsible recently for the creation of man-made diamonds.

In conventional mounting, as much as 90% of the diamond used may be buried in the tool in order to gain rigidity and prevent loss of the stone. With Hall's method, the crystal is mounted in a shallow cavity thus permitting use of a considerably smaller diamond for a comparable application.

One secret is the use of titanium hydride as a "wetting agent," and a solder, such as silver-copper. The parts are brazed by induction or radiation heating in a high-vacuum system, or in an atmosphere of very pure argon or hydrogen gas.

Dr. Hall's process already shows great promise of industrial use. The advantages claimed are four-fold: (1) The diamond is more securely anchored to its mount; (2) the waster "root," which in many cases is three-fourths of the volume of the entire tool point, can be eliminated; (3) much smaller diamonds can be mounted to provide the same working surface; and (4) heat transfer is better when a diamond is bonded to metal than when there is only a mechanical connection. A cooler working diamond will wear longer and is less likely to fracture from thermal shock.

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Squeeze Riveter Adapted to Hole Piercing

An ingenious attempt to break a production bottleneck at Glenn L. Martin's resulted in a method less costly than the one it was to supplement. Facilities, for drilling small holes in contoured sheet metal parts that could not be stack-drilled, nor pierced on a punch-press, were overloaded.

Several surplus rivet squeezers were taken from storage and converted into piercing presses to provide extra capacity. The squeezers were provided with base plates for mounting them vertically on a table, anvils, and pierce punches. They are used with standard drill templates without drill bushings.

Production schedules were met and savings resulted from the higher speed of piercing as compared to drilling, and the elimination of a burring operation.

Factual data on GRC's extensive line of zinc alloy fasteners for every industrial need . .

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WORLD'S FOREMOST PRODUCER OF SMALL DIE CASTINGS

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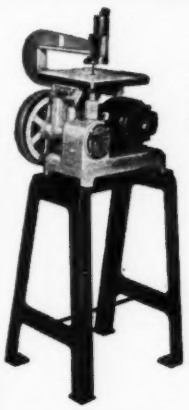
CUT TOOL AND DIE-MAKING COSTS WITH . . . Milwaukee DIE FILERS PROFILE GRINDERS



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. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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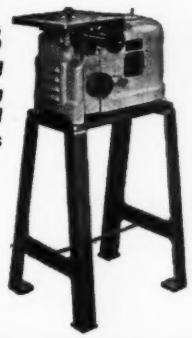

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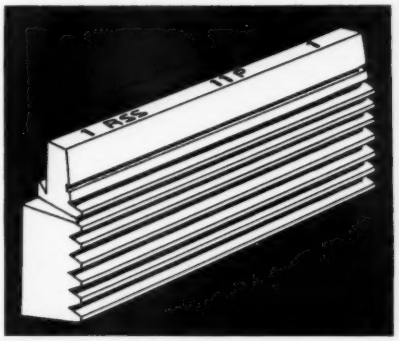

NOW AVAILABLE FROM STOCK for Tangental Die Heads

As a NEW SERVICE TO INDUSTRY . . . a complete line of Carbide-Tipped Chasers for Tangental Die Heads is now available. They are in stock for immediate shipment, in two grades . . . the widely-used Non-Ferrous Grade and the Steel-Cutting Grade. The latter will give outstanding performance on most steel threading jobs.

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Our new Carbide-Tipped Chasers have been thoroughly proved in service, on aluminum, bronze and all non-ferrous materials. They have also proved satisfactory on some stainless and aircraft steels.

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THE ECCENTRIC FIXTURE KEY BY PRODUCTION AIDS

The eccentric is an adjustable fixture key. Developed for the fast accurate correction of instrument fixture misalignment and now proven in general industry, it has created an entirely new concept in fixture key design.

Patent Pending

The ECCENTRIC ADJUSTABLE FIXTURE KEY eliminates the need for expensive jig boring or precision locating slot milling. Simply press in from a scribed line. Fixture is aligned on machine and keys locked in position. Locking is positive until such time as realignment for another machine might be required.

The eccentric will allow accurate correction of misalignment to 1/16 inch on faceplate or milling machine fixtures.

PRICES COMPARABLE TO PLAIN FIXTURE KEYS

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Self-aligning Comtorplug precisely and easily gages the three jaw seats in this chuck body —

WITH ACCURACY TO FRACTIONS OF .0001"

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

Unique Advantages

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed —not passing—reading.
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- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable—no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

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with job designed

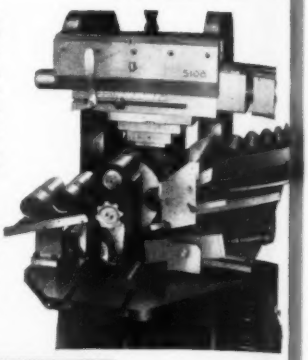
GEO. T. SCHMID

Production Marking Machines

The fully automatic, hydraulically - operated tube marker shown here was designed by GTS engineers for major automotive manufacturers.

The units roll a trademark and part number on 2500 to 3000 mild steel thin-walled tubes per hour — a speed that cuts cost per impression to the bone. Hydraulic control keeps all impressions clean, accurate, and of precisely the same depth.

Have a GTS Sales Engineer call on you, without obligation, to discuss how modern marking methods can save costs and speed production in your operation.



GEO. T. SCHMIDT, INC.
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IF IT'S WORTH MAKING, IT'S WORTH MARKING

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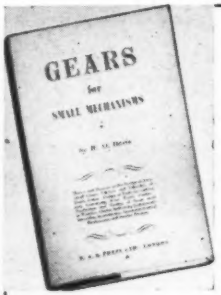

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AUTOMATIC GAGE MEASURES AND CLASSIFIES

Measuring the O. D. of precision ball bearings and sorting them into 12 good classifications of 0.00001″ each plus oversize and undersize is performed by a new, completely automatic hopper-fed Electronic Gage built by Federal Products Corporation.

The gage is built in two models. One will handle balls varying in diameter from ¼″ to 17/32″ at an operating speed adjustable to sort bearings up to 24,000 per hour.

The other gage of similar design, Model 143 B-17, operates at a slightly lower speed to measure a wider range of balls, 1 mm to 1″ O.D., and sorts them into 12 good classifications. Neither gage will mark the polished surface of the balls. An ingenious lifting mechanism retracts the gaging contact before and after measurement.

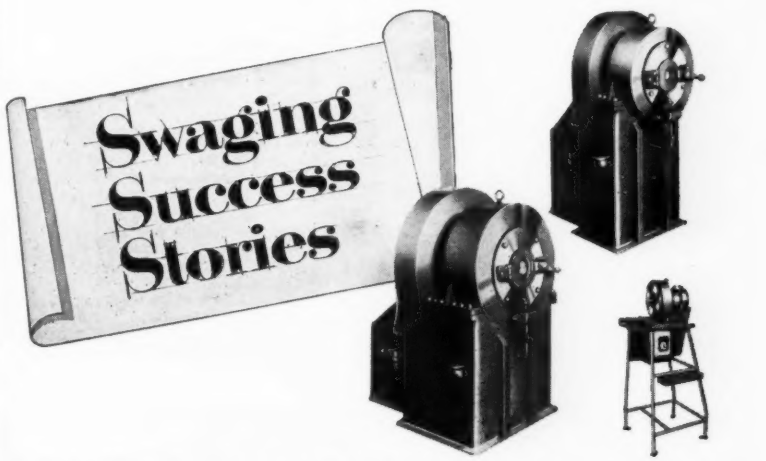
Both gages are completely automatic. The operator fills the hopper and presses the start button. The gage then measures

and sorts balls according to diameter. Fatigue and missorting are completely eliminated.

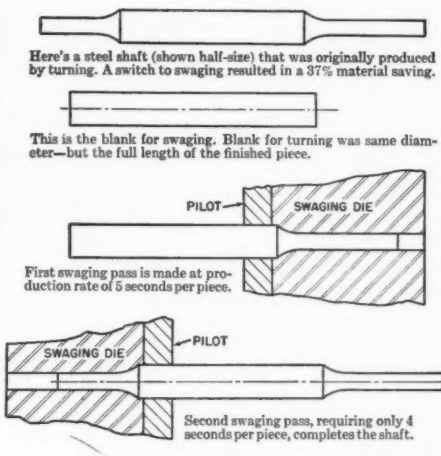
From the rotary type hopper the balls drop into one of the 8 holes in the rotating index wheel. As the ball is carried beneath the sensitive contact, the contact is retracted. At the proper time sequence, determined by timing microswitches, the sensitive contact is lowered to the ball O.D. and the size is found by the Electronic Gage Head and Amplifier. This signal, in the form of an electronic impulse is transmitted to the correct O.D. size station in the classifier which causes a mechanical "memory" to be "set".

The gage sensitive contact retracts and the index wheel transfers the ball to the large wheel which carries it around to the correct size disposal chute. When the ball is at the correct chute, the trap door beneath it is opened by action of the mechanical "memory" and the ball drops into an oil-filled tote box beneath the gage front.

This gage can be modified to sort precision roller bearings for diameter, and/or length, to sort dowel pins, cylindrical bearings, precision mandrels, etc.



37% Savings in Material . . . by swaging


Here's a steel shaft (shown half-size) that was originally produced by turning. A switch to swaging resulted in a 37% material saving.
This is the blank for swaging. Blank for turning was same diameter—but the full length of the finished piece.
PILOT
SWAGING DIE
First swaging pass is made at production rate of 5 seconds per piece.
SWAGING DIE
PILOT
Second swaging pass, requiring only 4 seconds per piece, completes the shaft.

Check these advantages of swaging

substantial savings in material
high burnished finish
close tolerances—accurate to ±.001
savings in labor—through higher production rate and use of unskilled labor

Write for our informative booklet on swaging. It contains detailed descriptions of the Torrington Rotary Swagers. You may find that swaging offers important advantages over your present fabrication methods.

THE TORRINGTON COMPANY
Swager Department
6 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

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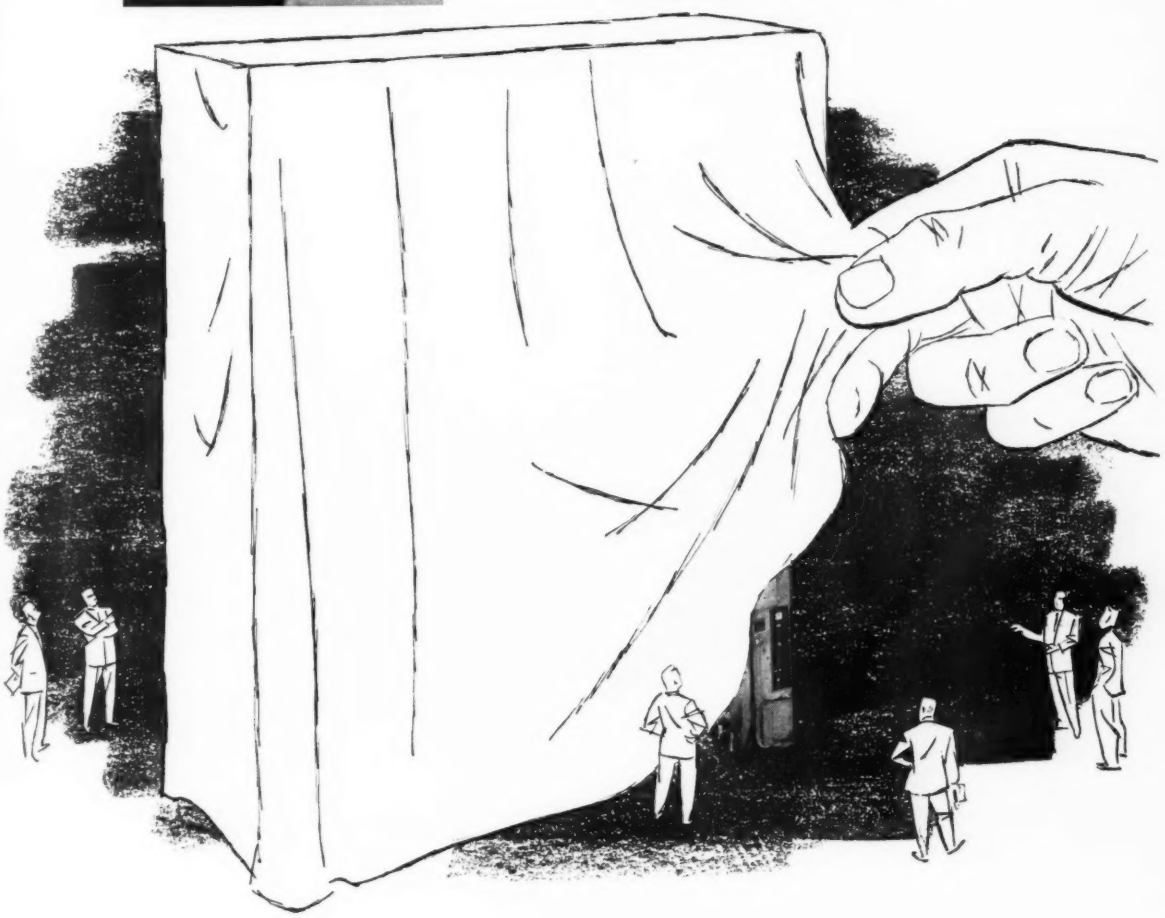

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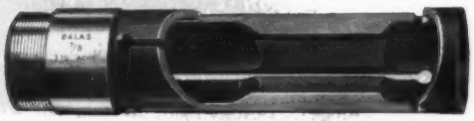

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